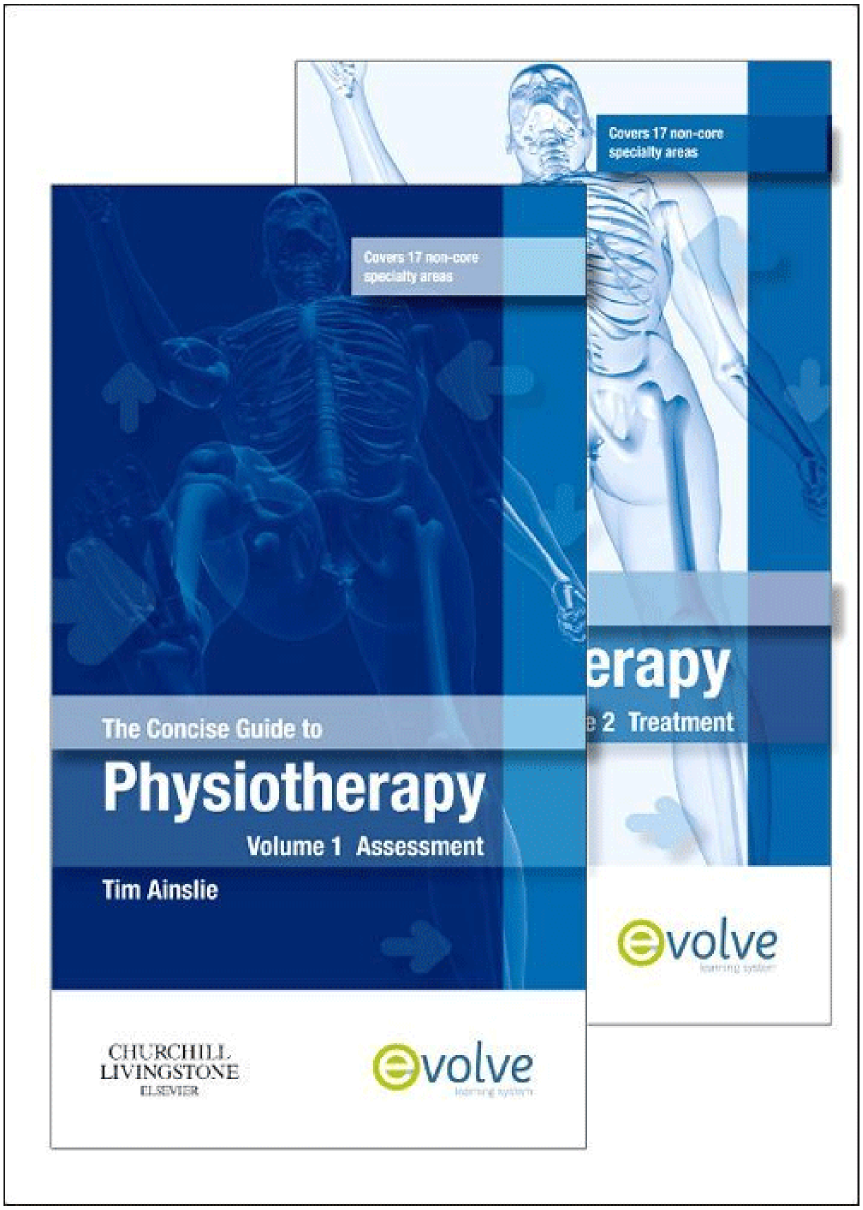

The Concise Guide to Physiotherapy - Volume One

Assessment

The Concise Guide to Physiotherapy - Volume Two

Treatment

Tim Ainslie, MSc GradDipPhys MCSP MMACP
Clinical Education Co-ordinator/Senior Lecturer, Physiotherapy Programme, Oxford Brookes University, Oxford, UK

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Contributors

Anne Alexander, MSc BSc(Hons) MCSP MMACP
Clinical Specialist Physiotherapist, Hand Therapy and Plastic Surgery Department, John Radcliffe Hospital, Oxford

[Chapter 4 – Burns and plastic surgery]

Rebecca Aston, MA MCSP
Specialist Women's Health Physiotherapist, Community PFD Service Team Lead, Homerton Hospital, London

[Chapter 11 – Obstetrics and gynaecology]

Kate Baker, BSc(Hons) MCSP
Macmillan Clinical Lead Physiotherapist, Velindre Cancer Centre, Cardiff

[Chapter 12 – Oncology and palliative care]

Sally Braithwaite, MCSP
Clinical Professional Clinical Lead, Inclusion Services, Birmingham Community Healthcare NHS Trust, Birmingham

[Chapter 5 – Community paediatrics]

Louise Briggs, MSc BSc(Hons) MCSP
AHP Therapy Consultant – Acute Rehabilitation, St George's Health Care NHS Trust, London

[Chapter 7 – Gerontology]

Joanna Camp, BSc(Hons) MCSP
Specialist Physiotherapist, National Spinal Injuries Unit, Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust

[Chapter 16 – Spinal cord injuries]

Maureen Carter, BA MCSP
Retired Senior Physiotherapist in Community and Intermediate Care, Croydon, Surrey

[Chapter 6 – Community physiotherapy]

Mark L. Clemence, MPhil GradDipPhys MCSP
Clinical Specialist Physiotherapist, South Devon Healthcare NHS Trust, Devon

[Chapter 15 – Rheumatology]

Mary Jane Cole, MSc GradDipPhys MCSP ACE
Senior Lecturer, Practice Education, Kingston University and St George's University of London, London

[Chapter 2 – Amputee rehabilitation](#)

Karen Edwards, MSc MCSP
Clinical Specialist PhysiotherapistGreat Ormond Street Hospital, London

[Chapter 5 – Community paediatrics](#)

Susie Grady, MSc BSc(Hons) MCSP
Aquatic Therapy Team Leader, The Gardens and Jacob Centres, Hertfordshire

[Chapter 3 – Aquatic physiotherapy](#)

Caroline Griffiths, GradDipPhys MCSP
Professional Lead, Physiotherapy, Oxford Health NHS Foundation Trust, Oxford

[Chapter 10 – Mental health](#)

Vicki Harding, PhD MCSP
Research and Clinical Specialist Physiotherapist, INPUT Pain Management Programme, St Thomas' Hospital, London

[Chapter 13 – Pain management](#)

Nicola Harmer, GradDipPhys MCSP
Highly Specialist Physiotherapist/Directorate Manual Handling Advisor, Directorate of Learning Disability Services, Abertawe Bro Morgannwg University Health Board

[Chapter 8 – Learning disabilities](#)

Scott Hawthorne, BAppSc MCSP MAPA
Band 7 Physiotherapist, Acute Spinal Injuries Physiotherapy Lead, National Spinal Injuries Centre, Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust

[Chapter 16 – Spinal cord injuries](#)

Andrea Hounsell, MSc BSc(Hons) MCSP
Physiotherapy Team Leader, Directorate of Learning Disability Services, Abertawe Bro Morgannwg University Health Board

[Chapter 8 – Learning disabilities](#)

Anne Jackson, PhD MSc BA(Hons) MCSP
English Networks Programme Manager, Chartered Society of Physiotherapy, London

[Chapter 3 – Aquatic physiotherapy](#)

Deborah Jackson, MSc BSc(Hons) MCSP
Clinical Specialist Physiotherapist, Great Ormond Street Hospital, London

[Chapter 1 – Acute paediatrics](#)

Captain Mark Jenkins, MSc BSc(Hons) MCSP RAMC
Officer in Command, Primary Care Rehabilitation Facility, Wellington Barracks, London

[*Chapter 14 – Rehabilitation*]

Lesley Katchburian, MSc MCSP
Clinical Specialist Physiotherapist (Neurodisability), The Wolfson Neurodisability Service, Great Ormond Street Hospital, London

[*Chapter 1 – Acute paediatrics*]

Karen Livingstone, MCSP GradDipPhys
Clinical Specialist Physiotherapist in Oncology and Palliative Care, St Ann's Hospice, Neil Cliffe Centre, Wythenshawe Hospital, Manchester

[*Chapter 12 – Oncology and palliative care*]

Marion Main, MA MCSP
Dubowitz Neuromuscular Centre, Great Ormond Street Hospital, London

[*Chapter 1 – Acute paediatrics*]

Mike Maynard, GradDipPhys HT
Clinical Lead in Aquatic Physiotherapy, United Lincolnshire Hospitals

[*Chapter 3 – Aquatic physiotherapy*]

Aileen McCartney, MSc BSc(Hons) MCSP
Senior Physiotherapist, Specialist Palliative Care, Wisdom Hospital, Rochester, Kent

[*Chapter 12 – Oncology and palliative care*]

Doreen McClurg, PhD MCSP
Reader, NMAHP Research Unit, Glasgow Caledonian University, Glasgow

[*Chapter 11 – Obstetrics and gynaecology*]

John McLennan, PG Cert Pain Management GradDipPhys MCSP
Lead Physiotherapist, Lothian Chronic Pain Service, Edinburgh

[*Chapter 13 – Pain management*]

Clare Nickols, MSc BSc(Hons) MCSP
In-Patient Team Leader/Deputy Physiotherapy Manager, Heatherwood Hospital, Ascot, Berkshire

[*Chapter 9 – Medicine*]

Jayne Nixon, BSc(Hons) Dip Sport Ex Med MCSP
Clinical Specialist and Clinical Lead – Lower Limbs Team, Defence Medical Rehabilitation Centre, Headley Court, Epsom, Surrey

[Chapter 14 – Rehabilitation]

Siobhan O'Mahony, PGDip Health Services Management GradDipPhys MCSP
Physiotherapy Manager, St Patrick's Hospital (Cork) Ltd, Cork, Ireland

[Chapter 12 – Oncology and palliative care]

Ankie Postma, GradDipPhys
Basildon Hospital, Essex

[Chapter 3 – Aquatic physiotherapy]

Davina Richardson, MSc BSc(Hons) MCSP
Clinical Lead Therapist, Neurosciences, Imperial College Healthcare NHS Trust, London

[Chapter 14 – Rehabilitation]

Karen A.J. Rix, GradDipPhys MCSP
Clinical Team Leader, Community Intermediate Care Service, London

[Chapter 6 – Community physiotherapy]

Andrew Rolls, MSC BSC(Hons) MCSP
Head of Sports Medicine, West Ham United Football Club, London

[Chapter 14 – Rehabilitation]

Janine Rutland, GradDipPhys MCSP
Community Paediatric Physiotherapist, The Avenue School, Reading, Berkshire

[Chapter 5 – Community paediatrics]

Josie Scerri, BSc(Hons) MCSP
Senior Physiotherapist, Neurodisability Service, Great Ormond Street Hospital, London

[Chapter 1 – Acute paediatrics]

Warren Sheehan, BPhty MCSP
Senior physiotherapist, John Radcliffe Hospital, Oxford

[Chapter 17 – Trauma orthopaedics]

Sara Smith, GradDipPhys PGCert(ClinEd) MCSP
Amputee Therapy Team Leader, Rehabilitation Gym, Douglas Bader Centre, Queen Mary's Hospital, London

[Chapter 2 – Amputee rehabilitation]

Sue Standing, MSc MCSP
Lead Physiotherapist, Hampshire Partnership Foundation Trust, Southampton

Chapter 8 – Learning disabilities

Robyn Stiger, MSc BSc(Hons) MCSP
Associate Lecturer, Physiotherapy Undergraduate Programme, Oxford Brookes University, Oxford

Chapter 1 – Acute paediatrics

Catherine Stringer, BSc(Hons) BEd MCSP
Senior Musculoskeletal Physiotherapist/Hydrotherapy, Physiotherapy Department, Good Hope Hospital, West Midlands

Chapter 3 – Aquatic physiotherapy

Clara Upson, BSc(Hons) MCSP
Advanced Physiotherapist Burns and Plastic Surgery Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust

Chapter 4 – Burns and plastic surgery

Anna Vines, BSc(Hons) MCSP
Senior Physiotherapist, John Radcliffe Hospital, Oxford

Chapter 17 – Trauma orthopaedics

Yvonne Wren, GradDipPhys
Retired Clinical Therapy Lead for Intermediate Care, Southwark; Retired Specialist Lecturer, University of East London, London

Chapter 6 – Community physiotherapy

Preface

Students and graduate physiotherapists report feeling underprepared when entering an unfamiliar practice area for the first time. The core areas of musculoskeletal, neurology and cardio-respiratory tend to be covered in depth in the university as students are prepared for practice placements and it is often the 'non-core' areas such as burns and plastic surgery or palliative care that can cause a student to feel anxious and underprepared. Written by specialists from the 'non-core' areas of practice the two volumes of this book aim to provide the student or graduate with an insight into the philosophy of approach that needs to be taken in either the assessment (volume 1) or the treatment (volume 2) of the individual in these placement areas. The material provides an entry level of knowledge with the expectation that the reader will access more 'in-depth' information, in order to supplement the material provided in the two volumes and on-line resources.

Tim Ainslie

Chapter 1

Acute Paediatrics

Neuromuscular disorders

Clinical features

Paediatric neuromuscular (NM) disorders are a diverse group of progressive conditions, characterised by muscle weakness and contractures that include the neck, spine, and jaw.

- Other features of NM disorders:
  - spinal deformity, e.g. scoliosis or increased lumbar lordosis
  - neck and spine rigidity
  - varying degrees of functional limitation
  - abnormal gait patterns and/or associated foot postures
  - toe walking
  - foot drop
  - frequent falls
  - pes cavus
  - developmental delay
  - lack of independent mobility
  - fatigue
  - respiratory involvement
  - cardiac problems
  - calf hypertrophy, e.g. Duchenne muscular dystrophy (DMD)
  - muscle wasting, e.g. type III spinal muscular atrophy (SMA)
  - facial weakness
  - winging scapulae
  - cramp or pain, particularly on exercise.

Children with neuromuscular disorders do not have increased tone, apart from a few who have very rare disorders, or increased tone due to a non-related condition: e.g. an unrelated hemiplegia.

Hypotonic as a term should be avoided, as the terms weak and low tone are frequently used interchangeably; they are not the same.

The conditions vary in many ways, but often the greatest concern for therapists is the rate of progression of symptoms.

An important consideration is the effect of growth; while the underlying condition may be slowly progressive, the increase in height and weight can have a major effect on motor performance and function.

It is important to understand that progressive neuromuscular disorders are frightening for parents and children. The children, especially the weakest ones, will be wary of strangers and may need time before they will co-operate with assessment.

Assessment

This will vary according to age, function, whether an infant, child or teenager is being assessed for the first time or if they are being reviewed.

Subjective assessment

- During the initial assessment, an overview of the onset, progression and major functional difficulties needs to be established.
- Is there any family history of muscle disorders or developmental delay?
- Are the problems getting worse, improving or staying the same?
- If function or power has deteriorated, has this happened gradually or rapidly?
- Is the child experiencing symptoms of nocturnal hypoventilation?
- Weaker children with neuromuscular conditions often suffer from nocturnal hypoventilation, i.e. they under-breathe when asleep.
- To ascertain whether a child may be developing this problem, the following questions should be asked:
  - Do they sleep badly (some complain of nightmares)?
  - Do they have morning headaches?
  - Do they find it difficult to wake or are slow to wake?
  - Do they demonstrate morning anorexia (refuse to eat breakfast)?
  - Do they experience daytime sleepiness or lack of concentration at school?

Babies and infants

- The following need to be considered when assessing babies or infants:
  - Duration of pregnancy; full term?
  - Did the baby move appropriately in utero?
  - Did they require any respiratory or feeding support in the neonatal period?
  - Is the baby making progress in their development?
  - Do they have good head control and have they reached their appropriate motor milestones?
  - Does the baby interact with parents and their environment?
  - Does the baby have good general health or are they prone to chest infections?

- Was the baby born with or have they developed any contractures?

Ambulant children

- When assessing an ambulant child the following need to be considered:
  - What age did they walk independently?
  - If walking is deteriorating, when did this begin?
  - Is walking slower than expected?
  - How far can the child walk in terms of time or distance? It may be necessary to specify on a 'good day', or when allowed to go at their own pace.
  - What limits walking; falls, fatigue, pain?
  - What are the major functional difficulties? for example; climbing stairs, getting up from the floor and running.
  - Outdoors, can they manage kerbs and slopes?
  - Does the child get cramp or pain: and if so where? Are there precipitating factors? Is it most apparent after exercise?
  - Have they had previous factures or surgery?
  - Are they using any splints or orthotics?
  - What exercise and activity do they do?
  - Do they swim, ride a bicycle, play football, dance, do gymnastics or participate in any other activities?
  - Do they play any musical instruments?
  - Do they join in during PE sessions at school?

Non-ambulant children

- When assessing non-ambulant children the following need to be considered:
  - Can they sit independently?
  - Did they ever walk and if so, when did they lose the ability?
  - How do they mobilise?
  - Have they any specialist equipment?
  - How much are parents carrying or lifting them?
  - What are the access issues at home or outside at school or nursery?

Considerations for teenagers

- Onset of disorders in the teenage years can be especially hard – being a teenager is difficult enough!
- There may be conflicting history with parents or playing down of symptoms to feign normality.

Objective assessment

Assessment of infants, children and adolescents will focus on the evaluation of muscle power, joint range and contractures, mobility, posture and function.

In some centres, respiratory function is tested by physiotherapists.

For babies and infants, an assessment of developmental milestones is needed.

Development

- Does the baby have good head control?
- Are they trying to roll?
- Can they get into sitting, or safely lie down once placed in sitting?
- Do they get distressed when placed prone?
- Do they/did they crawl and/or bottom shuffle?
- Can they take weight through their legs when placed in standing?

Muscle power:

- Assessment of muscle power in clinical practice on the whole follows the MRC grading/Oxford scale of 0–5 (MRC 1976).
- Standardised starting positions must be used to ensure reproducibility.
- Pure movements are tested at the neck, trunk, hips, knees and ankles, shoulders, elbows forearms and wrists.
- Rotation movements are not tested, as they are not pure movements. Although strong and often used to compensate for weakness, it is difficult to separate the components of the movement.
- Objective measurement of force using a hand-held dynamometer, also known as myometry, has been shown to be more reliable as a means of measuring muscle power in children (Wadsworth et al 1987) (Figure 1.1).

Figure 1.1 Hand-held dynamometer.

With kind permission of Citec, www.citec.nu.

Joint contractures

- Contractures may be present which can influence joint range of motion.
- Caused by shortening of the muscle and other structures around the joint.
- The muscles can be:
  - Fibrosed, due to underlying disease
  - Shortened, through lack of movement or muscle imbalance
  - Shortened, due to repeated poor posture or a reduced repertoire of movement.
- There are children who have joint hypermobility or a combination of hypermobility and contractures.
- Marked hypermobility can be as debilitating as contractures and should be recorded.
- Contractures are more severe and widespread in non-ambulant children.
- They are apparent at birth in many of the congenital muscular dystrophies, but can occur in all of the neuromuscular disorders over time.
- The site of contractures can be related to the underlying pattern of muscle weakness and to the functional level of the child (ambulant or non-ambulant).
- Contractures are important where they interfere with function.
- The most frequently encountered contractures are:
  - Hip flexion
  - Ankle, loss of dorsiflexion
  - Iliotibial band (ITB)
  - Elbow
  - Long finger flexors
  - Loss of supination
  - Knee
  - Neck and spinal rigidity
  - Mid-foot, leading to pes cavus deformity.

Measurement of joint range

- Commonly joint range is measured using goniometry.
- Standardised starting positions and measuring methods need to be defined to ensure repeatability.
- It is also very important to know what constitutes 'normal' range when considering the presence of reduced joint range.
- Neck range of movement and spinal mobility are routinely assessed.
- Hamstring range is measured routinely recording the popliteal angle. However tighter hamstrings are a prerequisite for children with pelvic weakness, to ensure the highest level of function.
- Hamstring tightness is not considered to be a problem unless it is associated with collagen disorders, e.g. Ullrich congenital muscular dystrophy (CMD) or Bethlem CMD.

Subjective assessment

Birth history

- Health of mother and baby during pregnancy including any medication taken
- Gestational age of baby
- Labour and delivery process
- Postnatal problems or care needed.

Development

- Unusual childhood illnesses
- Developmental milestones: e.g. at what age did the infant first roll, sit or walk (Sheridan et al 2008)
- Information regarding school (as appropriate):

Family history

- Number, age and health of siblings
- Similar presentations within family.

Parent/carer concerns

- Take their concerns seriously, as their instincts are often accurate and may help focus your assessment.

Pain

- The manner in which a child expresses pain will depend on their age and may manifest in the following ways:
  - Altered sleep patterns and feeding
  - Distress on handling or movement of the affected area
  - Continuous crying in the presence of severe pain
  - Avoidance of moving the affected part or altered function, e.g. limping
- A child may only be able to give a vague description and localisation of pain
- Be aware of underplaying or exaggeration of symptoms in adolescents wanting to either participate in or avoid sports or other activities.
- Various pain assessment tools are available depending on the age and cognitive ability of the child, e.g. pain faces scale (Hicks et al 2001), paediatric pain profile (UCL, ICH, RCNI 2003).

Objective assessment

Baby

- The most rapid period of growth and development occurs in the first 18 months of life.
  - By 2 years a child is already approximately half their adult height.
- A fastidious approach is vital as infants tend to be unable to indicate where problems are or to comply with assessment.
- Undress the whole child, irrespective of the referral, to avoid missing any orthopaedic problems or diagnostic clues.

Observation

- Overall size and proportion of child
- Count number, and check separation, of toes (indications of congenital abnormalities)
- Asymmetries (postural deformities are frequent in neonates and may occur as a result of intrauterine pressure or positioning)
- Any baby with asymmetries may have an increased risk of hip dysplasia
- In particular, note any:
  - Plagiocephaly (flattening of the skull)
  - Torticollis (asymmetry of neck movement)
  - Postural foot deformities

Movement and functional strength

- Spontaneous movement patterns
  - Reduced movement of any joint can be indicative of septic arthritis
  - Reduced movement of an upper limb may indicate Erb's palsy
  - Passive range of movement
- Joint range will change with age and so the therapist should refer to texts for normal ranges in infants
  - In the newborn, joint position will be affected by intrauterine position, i.e. lateral hip rotation, knee and hip flexion contractures, and excessive dorsiflexion are common (Staheli 2008).

Spine check

- A baby's spine should be straight with a single C-shaped curve. Scoliosis is always abnormal in a baby and should be investigated.
- Look for skin changes such as hairy patches, birth marks, café-au-lait patches and skin dimples over the spine indicating underlying spinal problems, e.g. spina bifida occulta, spinal dysraphism or neurofibromatosis.

Hip screening

- Babies in the UK are routinely screened for hip dysplasia; however developmental dysplasia of the hip (DDH) is occasionally missed.
- Hips should be checked for:
  - Range of abduction
  - Asymmetric skin folds
  - Apparent femoral shortening
  - Ortolani and Barlow tests for instability (Barlow 1962; Ortolani 1976; AAP 2000).

Child (age 2½ until adolescence)

- During this time growth and development continue, but at a slower rate than in infancy. However, because childhood lasts so long, the majority of growth and development occurs during this period.

Range of movement

- Active and passive joint ROM:
  - Note joint laxity, defined by examining range of extension of ankles, knees, elbows, wrist, thumbs and fingers
  - Excessive laxity is a contributor to the pathogenesis of hip dysplasia, genu valgum, recurrent patella dislocation and pes planus. It can also provide an alert to other problems, e.g. Ehlers–Danlos or Marfan's syndrome and osteogenesis imperfecta.
- Muscle length (popliteal angle, Silfverskiöld test).
- Bony rotational profiles:
  - Tibial torsion
  - Thigh foot angle
  - Femoral anteversion.

Muscle power

- Medical Research Council Scale (MRC 1976) or Hammersmith functional motor scale, as appropriate (Main et al 2003).

Limb lengths (and girth)

- Tape measure:
  - In the presence of congenital deformities, functional leg length discrepancy measurement is taken from the ASIS to the base of the heel.
- Galeazzi sign:
  - Child supine, hips and knees flexed with feet aligned, assess whether leg length difference is from femur or tibia.
- Blocks:

– It is often more accurate to ask the child to place their shortened limb on blocks of differing heights until the pelvis is aligned or the child feels level.

Joint stability

- Abnormal joint shape and absence of ligaments are frequent features of congenital deformities.

Gait

- Normal gait does not mature until around the 7th year.
- Check shoes for contact areas and wear patterns.
- Video, Physician rating scale, Edinburgh gait scale (Maathuis et al 2005).
- Gait laboratory may be helpful for children with neuromuscular disorders, preoperative planning and assessing postoperative outcomes.

Normal variants

- Children vary in shape, size and rate of development and therefore ranges of normal are not easily defined.
- Many children referred to orthopaedic clinics have nothing wrong with them and most variations are outgrown (Bennett 2002).
- An aim of the assessment in these children is therefore to exclude abnormality, e.g. using 5S's (Jones and Hill 2000):
  - *Symmetry*
    a. If both limbs are affected equally, the presentation is more likely to be normal physiology and management is to monitor.
    b. Severe or asymmetric deformity warrants referral for further investigation.
  - *Symptoms*
    a. If the child is not complaining of any symptoms or experiencing functional difficulties, intervention is unlikely to be needed.
  - *Stiffness*
    a. Joint stiffness in a growing child requires further investigation.
  - *Systemic disease*
    a. Inflammatory and metabolic conditions can affect skeletal growth, therefore establish whether a child is medically well.
  - *Skeletal dysplasia*
    a. Growth charts determine whether height and weight are within normal proportions. Unusual facial features may also indicate a dysplasia.
    b. Deformity in children will never be truly static due to ongoing growth, therefore careful and regular monitoring is required.

Motor disorders

- Motor disorders can be due to:
  - Cerebral palsy (Box 1.1)
  - Genetic disorders, e.g. hereditary spastic paraplegia
  - Metabolic disorders, e.g. mitochondrial disorders, leucodystrophies
  - Acquired brain injury.
- In order to share a common language and aid communication about a child's difficulties, the child should be provided with a diagnosis whenever possible and given a classification which describes their motor function:
  - Distribution: Unilateral, bilateral or total body involvement
  - Type: Spastic, hypotonic, dyskinetic (dystonic or athetoid) or ataxic
  - Severity: If the child has cerebral palsy, there are specific tools available to determine severity levels (Box 1.2).

Box 1.1 Definition of cerebral palsy

Cerebral palsy

- The term used for a group of non-progressive disorders of movement and posture caused by abnormal development or damage to the motor control centres of the brain
- The most prevalent cause for motor disorders in childhood with 2–3 per 1000 live births (Heinen et al 2009)
- CP is caused by events before, during or after birth (up to 2 years of age)
- The abnormalities of muscle control that define CP are often accompanied by other neurological and physical abnormalities
- The non-motor features that accompany the muscle control issues of CP include:
  - Sensory disturbance (vision, hearing and touch)
  - Feeding difficulties
  - Dysarthria
  - Drooling
  - Bladder dysfunction
  - Epilepsy
  - Hydrocephalus
  - Learning difficulties
  - Behavioural problems

Box 1.2 Descriptors of severity in cerebral palsy

- The Gross Motor Function Classification System (GMFCS), defines five levels of motor ability (www.canchild.com)

- The Manual Ability Classification System (MACS) defines five levels of hand function (www.macs.nu)
- The Functional Mobility Scale (FMS) assesses mobility in children across 3 distances (www.rch.org.au/gait)

Assessment

- Children are usually referred for a secondary/tertiary neurological opinion within a hospital setting, generally for consideration of the diagnosis and prognosis.
- The physiotherapist in this setting works as a member of a multidisciplinary team, which may consist of a paediatric neurologist and/or neurodisability paediatrician.
- The WHO International Classification of Functioning, Disability and Health (http://www.who.int/classifications/icf/icfapptraining/en/index.html) is a framework for measuring health and disability and should be adhered to or considered when carrying out an assessment (Appendix 1.1).

Subjective

- Before starting the assessment, it is useful to understand the questions, concerns and priorities of the family.

Birth history

- Acquire as much information as possible from the referrer to reduce the duplication of assessment questions and distress this can cause repeating what is often a traumatic neonatal history.
- Prenatal and perinatal history should be obtained if it is not available, including an account of pregnancy and birth history to ensure that the presentation of the child fits with the possible causes of brain injury, e.g. preterm presentation or hypoxic injury at term.

Investigations

- Early ultrasound, CT or MRI scans provide information about the child's brain development in the early neonatal phase and later childhood.
- Blood tests including genetic testing can exclude metabolic or hereditary causes.
- A baseline hip X-ray particularly with the more severely affected children (GMFCS III–V) should be performed, especially when there is a description of pain or asymmetry.
- Children at risk of hip subluxation require regular pelvic X-rays and date of last imaging should be known.

Past medical history

- Additional problems may influence a child's tone, e.g.:
  - Previous surgery
  - Ventriculoperitoneal shunt in situ following treatment for hydrocephalus
  - Associated problems, e.g. seizures
  - Feeding problems, reflux, percutaneous endoscopic gastrostomy (PEG) feeding following gastrostomy or swallowing issues
  - Frequent chest infections?
  - Difficulty managing saliva?
  - Constipation?

Communication

- How does the child communicate?
- Visual impairments?
- Hearing issues?
- Recent hearing check?

Drug history/medication

- Current medication
- Previous trials of medication and their outcome, e.g. child with spasticity and effects of Baclofen?

Family history

- Similar problems in the immediate and extended family?
- Are the parents consanguineous?

Motor milestones

- A detailed developmental history is required considering developmental milestones appropriate for the child's age (Sheridan et al 2008).
- It is also important to look out for any episodes of deterioration or regression.
- A progressive neuromuscular disorder is not usually associated with CP; however, a deterioration in mobility may be noticed around puberty.

Current functional ability

- Usual mobility at home, in school and generally?
- Do they use aids?
- Assistance required when walking?

- Daily routine in and out of school, e.g. participation in PE, after-school activities?
- ADLs, e.g. feeding, dressing, will give an indication of fine motor skills.
- Favourite activities? This enables understanding of the child and their cognitive ability.
- Is there a statement of special educational needs outlining how many hours of support they have?
- Consider the child as a whole person functioning within a family or school environment.

Professionals involved

- Which professionals are currently involved and to what degree?
- Previous interventions, e.g. botulinum toxin injections for spasticity.

Orthotics and equipment

- Current orthotics and equipment?
- Previously tried, e.g. sleep system?
- Current 24-hour postural management programme.

Objective assessment

- Children are often apprehensive in a hospital setting, take time to observe the child whilst sitting with their parent or carer.
- It is also possible to assess much of a child's functional ability whilst they play.
- It may be possible to video the assessment or components such as gait (written consent must be obtained).

Observation

- This should be done with the child in lying, sitting and standing (Box 1.3)

Box 1.3 Observation of the child

Lying

- Posture
  - Check for asymmetry, dystonic posturing, increased tone and use of base of support
- Abilities
  - Check if moving limbs, head and trunk against gravity; assess gross motor skills and transitions, e.g. forearm support in prone, rolling
- Observe
  - what they can do, how they perform the activity, what is limiting them from

achieving the next motor milestone

Sitting

- Postural influences
  - e.g. tight hamstrings may cause posterior tilt of the pelvis; dystonic spasms; athetoid movements; independent sitting
- Observe
  - balance reactions, saving reactions, sitting on the edge of a plinth (with feet supported and unsupported), mat sitting looking at the ability to weight shift and reach laterally out of the base of support
- Check the spine
  - while sitting on the edge of a plinth, provide gentle traction through the spine to see whether low trunk tone is contributing to a postural scoliosis, forward slump test can also help differentiate between structural or postural curve. Request a spinal X-ray if in doubt, especially if pelvic and hip mobility is limited.

Standing

- Posture
  - shoulder and pelvic levels, foot posture and how correctable this is
- Static and dynamic balance. While observing single leg stance, check balance reactions around ankle if any, if not, where compensation occurs
- Pelvic control
- Ability to jump and hop, any associated reactions or dystonic posturing?

Functional ability

- Assessment of younger children may focus on floor mobility, whereas higher-functioning older children may need the focus to be on gait or higher functions, e.g. running.

Standardised functional tests

- For extensive assessment of gross motor skills, the gross motor function measure (GMFM) GMFM-88 or GMFM-66 can be used.
- Upper limb standardised functional assessment of bimanual function can be evaluated using the Assisting Hand Assessment (Krumlinde-Sundholm et al 2007), SHUEE, Physicians Rating Scale (Davids et al 2006).

Muscle power

- Formal testing may be difficult when a child is very young or if cognition is affected.
- In these cases look at functional activities, e.g. rising from sitting to standing or repeated toe standing.
- If the child is able to you can examine their ability to activate and sustain muscle contraction using the 5 point MRC scale (MRC 1981).

Selective muscle control

- Selective muscle control will influence the gait cycle and the child's general mobility.
- If a child has poor selective control, they will use 'mass patterns' to move, e.g. hip flexion with knee flexion and dorsiflexion, followed by hip and knee extension with plantarflexion.
- When a child with poor distal selectivity is walking, it may be difficult for them to achieve dorsiflexion for foot clearance.
- There are various standardised assessment tools to assess selective muscle control:
  - SCALE (Fowler et al 2009)
  - Selective motor control grading scale description (Gage et al, 2009)
  - SMC (Selective Motor Control) (Boyd and Graham 1999).

Measuring joint range of movement (ROM), bony torsion, muscle length and muscle tone

- Measurement of ROM includes joint range and muscle length, bony torsion and tone across a muscle using a modified Tardieu assessment (Gracies et al 2010).
- Goniometry should be used, adopting standardised measuring positions.

Muscle tone

- It is important to differentiate between spasticity, rigidity and dystonia, as well as describing the severity of the abnormal tone.
- The hypertonia assessment tool can be used to help differentiate (Appendix 1.2).
- The Ashworth/Modified Ashworth (Bohannon and Smith 1986) and Tardieu/modified Tardieu scales are tools that the physiotherapist can use to measure spasticity/rigidity, dynamic spasticity and the 'catch'.
- Deep tendon reflexes are indicators of altered tone.
- Dystonia is usually seen at rest, spasticity increases during activity.
- Dystonic limbs return to a fixed posture and are mostly observed in hands and feet.
- Clinically dystonic postures are usually described but dystonia scales do exist such as the Barry Albright Dystonia Scale (Barry et al 1999) and the Burke–Fahn–Marsden Scale.
- Formal dystonia scales may be useful clinically if assessing the effects of therapeutic or

medical/surgical intervention.

Gait

- Video recording of gait enables the therapist to observe gait without a child having to repeat an activity.
- Video enables comparison of gait pre- and post-intervention.
- Children should be ideally dressed in tight-fitting shorts and if possible a tight-fitting vest to observe the trunk and pelvis.
- Observe general stability, e.g. walking with or without a walking aid, orthoses or shoes.
- How well does the child manoeuvre and stop and start.
- Scales designed to be used with video analysis include the observational gait scale (Mackey et al 2003) and the Edinburgh visual gait score (Read et al 2003).

Cardiorespiratory

- Respiratory infections are a leading cause of illness in children and are one of the main reasons that a child might be admitted to hospital.
- There are many anatomical and physiological differences when comparing the respiratory system of infants and children to adults.
- Children are more vulnerable to respiratory infections and complications than adults.
- The undergraduate student or recently qualified physiotherapist working in paediatrics will require support from an experienced paediatric physiotherapist in order to develop the necessary skills and techniques required to assess and manage infants and children.
- Paediatrics covers a wide age range (Table 1.1).
- Common reasons why an infant or child might develop respiratory failure, become acutely unwell and require admission to a neonatal, general paediatric or specialist cardiac intensive care unit can also be categorised by age (Table 1.2).

Table 1.1 Paediatric age ranges

Neonate	A baby less than 44 weeks of age from date of conception
Infant	Up to 12 months of age
Child	30 months–12 years of age
Adolescent	13–16 years of age

Table 1.2 Common causes of acute respiratory failure in children

Neonate	**Children under 2 years**	**Children over 2 years**
Prematurity	Bronchopneumonia	Asthma

Respiratory distress syndrome (RDS)	Respiratory syncytial virus (RSV) bronchiolitis	CNS infection, e.g. meningitis
Asphyxia (lack of oxygen before, during or after birth)	Asthma	Trauma
Aspiration pneumonia, e.g. meconium aspiration	Laryngotracheobronchitis (croup)	
	Foreign body aspiration, e.g. food, wrapper, toy	
	Congenital heart or lung abnormalities	

Assessment of the infant and child

- Assessment needs to be concise, to ensure that there is minimal disruption to the infant or child, but also effective.
- Much of the assessment can be performed prior to disturbing the child.
- The 'hands on' part of the objective assessment and treatment can be grouped together.
- This is particularly useful when assessing acutely ill children in intensive care.
- Before assessing, an explanation of why physiotherapy is required and what it will entail should be given and consent obtained from parents or carers.
- It is equally important to engage the child depending on their age and level of consciousness.
- Although parents are able to refuse physiotherapy, they seldom do in practice.
- Ideally the child should be rested and in as normal a state as possible to be able to tolerate physiotherapy.
- If the child is crying because of hunger, pain, or a full nappy, it is likely to exacerbate respiratory symptoms and the child is unlikely to tolerate treatment.
- To avoid the baby being sick and possibly aspirating, treatment should be commenced just before a feed, if possible, allowing sufficient time for its completion prior to that feed.
- This is important as optimal nutrition is critical in sick babies.

Subjective assessment

- Have you treated this patient before?
- If not, are they new to the service or have they been treated by someone else on the team?
- Medical notes are often extensive and bulky, important information may be missed, therefore it is important to communicate with the people involved with the child, e.g. members of the medical team, nursing team and parents or carers.
- If the child has a history of chronic respiratory disease they may have physiotherapy at home, therefore it will be necessary to communicate with the community physiotherapy team.

- Information from the medical notes/ward round/medical discussion:
  - Why has the child been admitted to hospital/PICU/NICU?
  - Is this their first admission?
  - Do they have a history of respiratory disease or are they usually fit and well?
  - How long has the child been in hospital/PICU/NICU?
  - Is the child's condition improving, deteriorating or stable?
  - Have there been any relevant changes overnight or within the last few hours affecting the stability of the child's condition?
  - What investigations have been reported on or are due to be undertaken. Does this affect physiotherapy treatment options?
  - What is the patient's medical plan for the day (e.g. extubation, CT scan etc.)?
- Information from nurse in charge of the patient:
  - How well is the child tolerating handling and interventions?
  - If they require suction, what type of suction is needed and when were they last suctioned?
  - What is coming up on suction and how frequently does it need to be performed?
  - When was the child last repositioned? What was the reason for doing this?
  - What is the nursing plan for the day?
- Previous physiotherapy intervention.
- This information may be obtained from the medical notes or from discussion with physiotherapy colleagues.
- Critically ill children may require additional out-of-hours physiotherapy intervention.
- To act in the best interests of a child, it is important to establish:
  - What main problems were identified by previous physiotherapy assessment?
  - What treatment techniques were used and why?
  - Did the patient tolerate these techniques and were they effective?
  - What did the physiotherapist suggest post treatment and was that plan carried out?
- Information from the child's parents/carers:
  - What is the child normally able to achieve from a developmental point of view? Remember to put this in context with what would be appropriate for their age.
  - Do they have physiotherapy at home?
  - If yes, why do they need it, how frequently is it performed and by whom?
  - If the child has a chronic respiratory illness (excess secretions) or a neuromuscular disease affecting their respiratory muscles (poor cough strength), they might require daily physiotherapy which has been taught to the parents by the community team.
  - They may also use physiotherapy adjuncts like a PEP mask, flutter or cough assist machine.

Objective assessment (prior to disturbing the patient)

- Consider what equipment and monitoring systems are being used?
- Is the child breathing spontaneously, using some kind of breathing support, e.g. CPAP, or are they intubated and mechanically ventilated?
- How awake are they?
- Are they on any sedation or pharmacologically paralysing drugs?
- What drains and lines are in situ? Identify where they are and why they are there, e.g. a chest drain for a pneumothorax.
- Look for cardiovascular system trends on the observations chart:
  - How stable is the child?
  - What is their heart rate and blood pressure and do they require inotropes to maintain these?
  - If they are on inotropes, are they increasing or weaning?
  - Do they have a temperature (usually indicative of an infection)?
  - Check that their electrolytes and platelets are within the normal range.
  - Is the child's overall fluid balance on a positive or negative trend?
  - What is their urine output (normal is 1 ml/kg/hour)
  - If they are ventilated note the mode of ventilation, tidal volume, pressures and respiratory rate.
  - How much oxygen do they require and is this going up or down?
  - If appropriate, look at the child's blood gas results with special reference to pCO_2.
  - Chest X-rays should inform the assessment and treatment options, compare most recent with previous films to determine any new focal problems or changes.

Objective assessment

- Colour, pink and well perfused, or are there signs of cyanosis?
- Breathing pattern.
- Adequately undress the child to observe the neck and torso.
- Any signs of respiratory distress (Box 1.4).
- Feel the child's chest movement, any moving secretions palpable? (tactile fremitus).
- Auscultate.
- Suction may be indicated as part of the assessment.
- Finally, establish what the child's main problems are and whether these problems can be addressed by physiotherapy intervention.

Box 1.4 Signs of respiratory distress

Raised respiratory rate (dependent on age)
Subcostal recession
Intercostal recession
Sternal recession
Tracheal tug/head bob

Nasal flare
Grunting (auto PEEP)
Apnoea
Respiratory arrest
Bradycardia
Asystolic cardiac arrest
Death

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Chapter 1

E-materials

Author profiles

Deborah Jackson MSc BSc(Hons) MCSP

Deborah Jackson is a specialist paediatric physiotherapist working in neuro-orthopaedics at Great Ormond Street Hospital in London. She qualified in 1993 and has worked within the field of paediatrics for 12 years, predominantly in the in-patient setting. She has lectured nationally and internationally, chiefly in the area of Cerebral Palsy and orthotic provision.

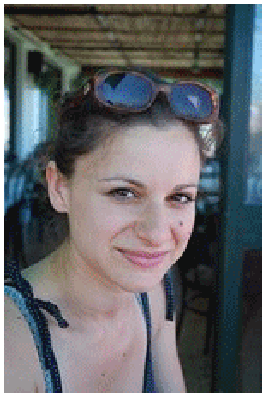
Lesley Katchburian MSc MCSP

Lesley Katchburian is a Clinical specialist physiotherapist working in Neurodisability at Great Ormond Street Hospital for Children in London. Lesley qualified in 1987 with a BSc (Hons) in Physiotherapy and gained a Masters Degree in Physiotherapy in 1997, with a thesis exploring the effect of Botulinum toxin A on function in children with Cerebral Palsy. Her specialist area is the management of tone in Paediatric Motor disorders and she works as part of an established multidisciplinary team in a tertiary setting.

An experienced clinician Lesley has contributed to guidelines about the use of Botulinum Toxin A in paediatrics, Guidance for Physiotherapy injectors and Transition for the young person with motor disorders. She is currently Research Officer for the Association of Paediatric Chartered Physiotherapist and is an executive member of The British Association of Childhood Disability.

Josephine Scerri BSc(Hons) MCSP

Josie Scerri is a senior Physiotherapist working as part of the Movement Disorder Service Team at Great Ormond Street Hospital. Josie has been working as a Paediatric Physiotherapist for 11 years.



Robyn Stiger MSc BSc(Hons) MCSP

Robyn qualified with a BSc(Hons) Physiotherapy from Keele University and gained an MSc in Advanced Cardiorespiratory Physiotherapy from University College London.

Clinical roles have included working as an Advanced Physiotherapist at the University Hospital of North Staffordshire, band 7 roles in cardiorespiratory, including paediatrics and paediatric ICU. Robyn is currently an associate lecturer at Oxford Brookes University.

Tim Ainslie MSc MCSP MMACP

Qualified 1984, The Middlesex Hospital School of Physiotherapy. A clinical and managerial career spanning 16 years included working at London's Hammersmith, Charing Cross and Whittington hospitals. Extensive experience was also gained in primary care settings in the NHS, the independent sector and with a charity initiating a physiotherapy service in Palestine. In 2000 joined Oxford Brookes University as a Senior Lecturer and Clinical Education Coordinator and is currently Joint Chair of the National Practice Education Forum at the Chartered Society of Physiotherapy.

Appendix 1.1

Appendix 1.1 WHO framework for measuring health and disability

Assessment measures available are listed in the categories specified in the WHO International Classification of Function.

This is by no means a comprehensive list, but indicates some of the more commonly used assessments currently in use in tertiary centres around the UK.

Body structure/function:
- Goniometry
- Modified Ashworth Scale
- Modified Tardieu
- Gait analysis – Edinburgh Visual Gait Score, Observational Gait Scale, Physician Rating Scale
- BFM/Barry Albright
- Pain scales: Wong–Baker, VAS
- Goal Attainment Scale (GAS)
- SCALE/SMC

Activity/participation:
- Functional Mobility Scale (FMS), Gillette
- Paediatric Outcomes Data Collection Instrument (PODCI)
- Gillette Functional Assessment Questionnaire (FAQ)
- GMFM
- Gait analysis
- PEDI
- COPM
- CPCHILD
- WeeFIM
- GAS

Appendix 1.2

Holland Bloorview
Kids Rehabilitation Hospital

Bloorview
RESEARCH INSTITUTE

HYPERTONIA ASSESSMENT TOOL (HAT) - SCORING CHART

Name: ____________	**Chart/File #:** ____________
Clinical Diagnosis: ____________	**Date of Birth:** ____________
Limb Assessed:	**Gender:** ☐ Male ☐ Female
☐ Arm ☐ Left ☐ Right	**HAT Assessor:** ____________
☐ Leg ☐ Left ☐ Right	**Date of Assessment:** ____________

HYPERTONIA ASSESSMENT TOOL (HAT)

HAT ITEM	SCORING GUIDELINES (0=negative or 1=positive)	SCORE 0=negative 1=positive *(circle score)*	TYPE OF HYPERTONIA
1. Increased involuntary movements/postures of the designated limb with tactile stimulus of another body part	0= No involuntary movements or postures observed	0	DYSTONIA
	1= Involuntary movements or postures observed	1	
2. Increased involuntary movements/postures with purposeful movements of another body part	0= No involuntary movements or postures observed	0	DYSTONIA
	1= Involuntary movements or postures observed	1	
3. Velocity dependent resistance to stretch	0= No increased resistance noticed during fast stretch compared to slow stretch	0	SPASTICITY
	1= Increased resistance noticed during fast stretch compared to slow stretch	1	
4. Presence of a spastic catch	0= No spastic catch noted	0	SPASTICITY
	1= Spastic catch noted	1	
5. Equal resistance to passive stretch during bi-directional movement of a joint	0= Equal resistance not noted with bi-directional movement	0	RIGIDITY
	1= Equal resistance noted with bi-directional movement	1	
6. Increased tone with movement of another body part	0= No increased tone noted with purposeful movement	0	DYSTONIA
	1= Greater tone noted with purposeful movement	1	
7. Maintenance of limb position after passive movement	0= Limb returns (partially or fully) to original position	0	RIGIDITY
	1= Limb remains in final position of stretch	1	

SUMMARY SCORE – HAT DIAGNOSIS

		Check box:
DYSTONIA →	Positive score (1) on at least one of the Items #1, 2, or 6	☐ Yes ☐ No
SPASTICITY →	Positive score (1) on either one or both of the Items #3 or 4	☐ Yes ☐ No
RIGIDITY →	Positive score (1) on either one or both of the Items #5 or 7	☐ Yes ☐ No
MIXED TONE →	Presence of 1 or more subgroups (e.g. dystonia, spasticity, rigidity)	☐ Yes ☐ No

HAT DIAGNOSIS: ____________
(Fill in all that apply)

HAT Manual can be accessed at http://www.hollandbloorview.ca/research/scientistprofiles/fehlings.php

Case Study 1.1

Respiratory

Background

- Baby A was a neonate who was 1 day old.
- She was born at 41/40 weeks gestation in the hospital car park before being admitted to NICU.
- It was thought that she had most likely aspirated meconium during birth and was being treated with antibiotics.
- The medical plan for Baby A, should she continue on this worsening trend, was to commence nitric oxide, use HFOV (high-frequency oscillatory ventilation) and refer her for ECMO.
- Baby A was referred via an emergency bleep for urgent physiotherapy assessment and treatment as she was deteriorating rapidly from a cardiorespiratory point of view.

Assessment

- Her mother was not present on our arrival to gain consent.
- On assessment Baby A was supine as she had just had an urgent chest X-ray.
- She was nasally intubated and ventilated using pressure control ventilation. A high peak pressure was required due to her age (PIP = 25 PEEP = 5). Respiratory set rate of 60.
- She was pharmacologically sedated and paralysed.
- Baby A required inotropes to maintain her blood pressure – her beside chart showed that these were on an increasing trend.
- Her fluid balance was acceptable, as was her urine output.
- Her oxygen requirement had dramatically increased throughout the course of the morning and was currently 80%.
- She was struggling to maintain acceptable saturations, her pO_2 was low and her pCO_2 was climbing.
- She also had a worsening respiratory acidosis.
- The nurse looking after Baby A said that she was finding it difficult to obtain much on suction, even with saline.
- The nurse of the previous shift had reported some small sticky dark plugs of sputum especially on turning.
- Baby A was not tolerating intervention particularly well with some episodes of desaturation and associated bradycardia.
- An urgent chest X-ray revealed opacification in both the right and left upper lobes. Air bronchograms were present in both the right and left main bronchi.
- Palpation assessment showed that she had reasonable chest expansion, with no palpable secretions.
- On auscultation, she had very quiet breath sounds throughout both sides with bronchial breath sounds in her upper chest areas. There were no added sounds.
- In conjunction with the MDT caring for this baby, the physiotherapist thought that Baby A's main problems were:
    - Secretion retention. Baby A was pharmacologically paralysed so did not have a cough reflex to move secretions for clearance on suction
    - Loss of lung volume as a result of the collapse/consolidation in her upper lobes caused by a combination of mucous plugging and resolving infection
    - High oxygen requirement with associated high ventilation pressures, both of which are damaging to delicate newborn lung tissue.

Treatment

- As the upper lobes were affected, Baby A was treated in supine. Both sides were treated in turn, with the baby's head turned to the left to treat the right side and turned to the right to treat the left side.
- Cycles of physiotherapy treatment consisting of:
    - saline instillation (varying from a few drops to 1 ml).
    - manual hyperinflation using a 500 ml open-ended paediatric bag (as Baby A was a

full-term neonate) with pressures of up to 30 cmH_2O and 5 cm PEEP
  - chest wall vibrations which mimic a cough in the absence of a cough reflex and move secretions via increased expiratory flow from the peripheral to the more central airways where they can be removed by suction.
- Endotracheal suction using a size 7 catheter was performed.
- Copious, thick sticky brown plugs of sputum were obtained.
- 8 suctions were needed in total. Baby A was stable throughout treatment. A reasonable amount of saline was used to avoid plugging off as the sputum was so thick.
- The physiotherapy plan post treatment was to position the baby in prone for 4–6 hours, turning the head from side to side as per normal protocol for a decent rest, and only to suction if required.
- Another physiotherapy session was required after 6 hours and was similar to above again treating Baby A in supine, but only three suctions were required.
- Physiotherapy treatment overall was very effective.
- Breath sounds were much clearer and there was better chest expansion.
- Oxygen was quickly weaned down first to 60% after the first treatment and then to 40% after the second.
- Inotropes were weaned as respiratory function improved.
- Ventilation pressures were also weaned down after the second treatment.
- Paralysing drugs were switched off on the second day, so Baby A was able to cough on suction and was able to be managed by the nursing staff.
- Baby A was extubated onto CPAP 2 days later and was discharged home 13 days later.

Case Study 1.2

Four-year-old boy with cerebral palsy

Background

- 4-year-old boy with diagnosis of cerebral palsy attends clinic. He was referred by local team for advice on management and due to parental concerns.
- Parents would like to know prognosis and their main difficulties are:
  - Personal care due to difficulty abducting legs
  - Positioning due to extensor spasms.
- He lives with his parents and is dependent on them for all mobility and has a variety of comorbidities such as reflux, seizures and poor cough and swallow.
- He is fed via PEG.
- He is able to communicate happiness or distress, but has no receptive or expressive communication.
- Drug history

- Seizure management medication
- Baclofen to manage tone.

- He attends nursery set up for children with special needs.
- He has input from local services and there has been no regression in his abilities.
- He has had blocks of treatment at the Bobath Centre in the past.
- He has appropriate equipment at home and at nursery for positioning, transfers and personal care.
- He has AFOs for use in standing frame.
- He has not trialled lycra.

Assessment

No previous MRI has been carried out and no investigations to ensure diagnosis of CP is correct.

Objective

- On examination, child presents with mixed pattern of spasticity and dystonia with extensor spasms through legs and trunk, and underlying low tone in trunk.
- He has limited mobility and would be classified as GMFCS V once diagnosis of CP is confirmed.
- There is asymmetry of leg abduction with apparent discomfort with hip movements.
- Wheelchair noted to allow client to posterior tilt and push into extension.
- Parents have good handling techniques.

Plan

- Hip X-ray (children from 30 months with CP or movement disorder should have hip X-ray if not yet walking).
- MRI to ensure presentation of child is consistent with MRI findings.
- Started on trihexyphenidyl to manage spasms (medication for dystonic spasms can be started irrelevant of diagnosis).
- Placed on waiting list for Botulinum toxin injections to hip adductor muscles.
- Review in 3–4 months to assess affect of trihexyphenidyl.

After appointment

- Info from conversation included in report and circulated to all members of local MDT.
- Liaison with local therapy team via telephone about outcome of appointment.
- Discuss whether lycra has been considered in the past and potential for it to be used now.
- Ask for contact details of wheelchair service to provide them with a copy of the report.

Telephone contact with family 2 weeks later

- Results of hip X-ray and MRI fed-back to parents:
- On reviewing hip X-ray, bilateral subluxation *was* noted and *he was* placed on the waiting list for joint Neurology and Orthopaedic clinic.
- Results of MRI are consistent with HIE with basal ganglia affected and therefore consistent with diagnosis of CP (if the MRI result was not consistent with CP, the child would be reviewed sooner and results fed-back to parents in person).
- Contact details of team given to parents should they have any queries.
- Info from conversation included in report and circulated to all members of MDT.
- Liaison with local therapy team via telephone.

Review after 4 months

- Trihexyphenidyl has reduced extensor spasms with resultant improvement in personal care; and positioning easier to manage.
- Taken off waiting list for Botulinum toxin injections.

Plan

- Review in 6 months to ensure dose still appropriate and no other complications arising, and to manage hips with Botulinum toxin as and when necessary.
- Parents able to call if concerns arise sooner for an earlier appointment.

Case Study 1.3

Background

- David a 5-year-old boy was admitted to PICU following an RTA head-on collision.
- David was in the front passenger seat, his mother carried him to a house nearby, at which point he complained that he couldn't feel his legs.
- He was placed on a spinal board and transferred to hospital by ambulance, he had a GCS of 14 at this time.

Assessment

- His injuries included:
  - Bruising where the seat belt had been
  - Lack of sensation and power below T4.
- Spinal CT showed:

– Spinal fractures of C5, C6 and C7
– Subluxation at C5/6 and C6/7 levels
– Cord transaction at C5/6 and oedema to C3.

Management

- He was transferred to PICU 2 days later for spinal surgery.
- Initial management included an aspen collar and sandbags with regular turns using log rolling.
- A further MRI confirmed initial findings and also revealed a PEG fracture.
- Cervical stabilisation was performed.
- Postoperative instructions included being nursed flat for 6 weeks for spinal cord optimisation with log rolling for pressure relief.
- Postoperatively he was given 2–5 L O_2 via nasal cannulae to maintain SaO_2.
- 2 days postoperative he developed a RUL collapse with worsening respiratory status requiring overnight facial CPAP – PEEP 5 cm.
- He also developed an occipital pressure sore and following recurrent UTIs he was catheterised.
- He had no abdominal muscles, therefore no effective cough and he was treated with positive pressure and an abdominal binder.
- Physiotherapy included:
  – Incentive spirometry
  – Blowing bubbles, etc.
  – Chest wall vibrations
  – Assisted cough (manual and with an abdominal binder).
- 19 days post collapse the bronchoscopy was performed to reinflate the lung. Post bronchoscopy, BiPAP was commenced with pressures of 16/6 with additional support from a Hayek Biphasic Cuirass Ventilation (BCV) (http://www.unitedhayek.com).
  – David used the Hayek 4 times a day with 2 cycles using the secretion clearance mode (CWV and inexsufflation).
  – This was stopped after 2 weeks and overnight BiPAP was stopped 2 weeks later.
  – At this point David was no longer on bed rest and was being stood using a tilt table.
  – He had no further respiratory problems during his time on the unit.
  – He was able to tolerate being able to sit out in a chair to watch TV or play on his play station and this was interspersed with daily sessions on the tilt table.
  – He was discharged to a spinal injuries unit 11 weeks post injury and at this point he could tolerate being upright to 50° for around 30 minutes.

Summary and conclusion

- David was admitted to PICU following his admission.

- He underwent surgery to stabilise his spine and during this time incurred some respiratory deterioration which was resolved with specific management.
- Following resolution of the respiratory problems David was able to begin sitting out of bed and to get used to being upright.
- He was given exercises for his upper limbs (games, karate and balloons).
- He was able to correct a tendency to lean to one side, indicating that he did have some control over his sitting balance.
- He was aware of his inability to feel below T4 and move his legs and appeared to accept this.
- He was given resting splints for his hands and feet.
- A specialist wheelchair had been ordered to coincide with his arrival at the spinal injuries unit.
- There was some preliminary communication with his school and local physiotherapy services so that they could prepare for his return after discharge from the spinal injuries unit.

Postscript

- This case demonstrates an anomaly between the level of cord transaction and the ensuing loss of power and sensation.
- David retained the ability to extend and flex the wrists and he was able to extend both elbows.
- There was some retained sensation down to T4 but nothing lower than this level.
- This discrepancy can occur in children and highlights the importance of completing an effective assessment and not to rely on imaging for the full presentation.

Chapter 1 Acute paediatrics multiple choice questions

1. If both parents are carriers of the cystic fibrosis gene, what is the likelihood of them having a child that has cystic fibrosis?
   a). a 1 : 6
   b). b 1 : 4
   c). c 1 : 7
   d). d 1 : 2
2. At 2 years a child can;
   a). Jump from a step using both feet together
   b). Sort and match objects
   c). Watch television and join in with songs
   d). Build a tower of 9 to 10 blocks

3. Children under 2 are likely to manage their pain better
   a). When anxious parents are encouraged to be with the child
   b). When a play therapist assists in the management of treatment
   c). When they are given the Eland colour scale to show where their pain is
   d). If they are allowed to play with toys
4. What is the correct term used to describe a 'non-progressive group of brain disorders resulting from a lesion or developmental abnormality in fetal life or early infancy'?
   a). Erb's palsy
   b). Cerebral palsy
   c). Duchene muscular dystrophy
   d). Motor neuron disease
5. The Ponseti Method is often used in the management of
   a). Congenital scoliosis
   b). Congenital talipes equinovarus
   c). Congenital pes planus
   d). Congenital hip dysplasia
6. Low muscle tone affects
   a). Joint stability
   b). Speed of movement
   c). Range of movement
   d). Cognition
7. Which of the following is required to perform efficient movement
   a). Fixation
   b). Strength
   c). Wide range of joint movement
   d). Flexibility
8. Botulinum Toxin Type A works by
   a). Blocking the signal between the nerve and muscle preventing muscle contraction
   b). Blocking the signal between the brain and the muscle preventing muscle contraction
   c). Blocking the signal between the antagonistic muscle to restore muscle balance
   d). Blocking the signal between the muscle and the brain
9. Which of these is a particular consideration for children's needs when planning treatment
   a). Social background
   b). Type of disability
   c). Level of understanding
   d). Ability to speak
10. A pattern of movement involves
   a). A muscle group
   b). One side of the body
   c). Several muscle groups

d). Grade IV+ (MRC) muscle power

11. The most common group of neuromuscular disorders are
    a). Congenital myopathies
    b). Peripheral neuropathies
    c). Congenital muscular dystrophies
    d). Progressive muscular dystrophies
12. Which of the following is *not* considered to be of concern if present in a small child?
    a). In toeing
    b). Genu varus
    c). Pes planus
    d). Bilateral genu valgus
13. Which of the following is *not* a risk factor for obstetrical brachial palsy?
    a). Overweight baby
    b). Baby following breech birth
    c). Baby delivered after a prolonged second stage of labour
    d). Baby delivered following an emergency caesarean section
14. Which of the following is *not* a treatment option routinely considered for obstetrical brachial palsy
    a). Regular assessment of range of movement and muscle power
    b). Passive stretches to prevent muscle and joint contractures
    c). Electrotherapy (ultrasound, interferential)
    d). Weight-bearing exercises through the affected limb
15. The most frequently encountered contractures are found in the.
    a). Hip flexors
    b). Knee extensors
    c). Wrist flexors
    d). Cervical side flexors
16. When assessing function in a child with a neuromuscular condition which of the following is *not* one of the main functional areas to be tested?
    a). Lifting the head
    b). Rolling
    c). Picking objects up from the floor
    d). Standing on one leg
17. Which of the following is not a typical way for a small child to express pain?
    a). Altered sleep patterns and feeding
    b). Continuous crying
    c). Vague description and localisation of pain in the child
    d). Exaggeration of symptoms
18. Which of the following is not an indicator of an underlying spinal abnormality?
    a). Dimple in the skin
    b). Café au lait patch
    c). Small area of excessive hair growth

d). Inability of the child to sustain long sitting

19. Which of the following is a test used for screening hips in babies?
    a). Gillet test
    b). Piedallu's sign
    c). Ortolani test
    d). Tortollini test
20. Which of the following is a test used to evaluate motor function in children?
    a). GMFM-88
    b). SFC-35
    c). AMTS
    d). VRS

Acute paediatrics multiple choice answers

1. b)
2. b)
3. b)
4. b)
5. b)
6. a)
7. a)
8. a)
9. c)
10. c)
11. d)
12. d)
13. d)
14. c)
15. a)
16. c)
17. d)
18. d)
19. c)
20. a)

Chapter 2

Amputee Rehabilitation

Introduction

- Amputation is the removal of a limb or part of a limb by surgery or trauma.
- Distinction must be made between those with acquired amputation through surgery or trauma and those with congenital limb deficiency.
- A student or novice physiotherapist who works in amputee rehabilitation will have the opportunity to acquire specific amputee-related knowledge and skills, e.g. oedema control, gait analysis and re-education and prosthetic management. Additionally they will be able to apply and develop musculoskeletal knowledge alongside communication skills, problem-solving and multidisciplinary team (MDT) working.
- The student or novice physiotherapist may assess and treat the primary amputee and/or the established amputee (LLIC 2010).
- Where there is no on-site specialist physiotherapist available for supervision and guidance it is important for the therapist to know when and where to seek specialist support, e.g. via a regional prosthetic centre.
- This chapter will cover the assessment of the adult amputee with acquired lower limb amputation, with some reference to the adult upper limb amputee.
- Advice on the assessment of the child with acquired amputation or congenital absence should be sought from regional specialist centres.

Amputations, a brief history

- Amputations have been carried out throughout history and until the advent of anaesthesia, improved surgical techniques, control of blood loss and effective infection control in the 19th century the mortality rate amongst amputees was high.
- The history of prosthetics can be traced back to 1000 bc, with manufacturing and function remaining basic until the 16th century.
- Throughout history warfare has resulted in accelerated prosthetic developments. Materials, design, function and patient comfort have evolved and been refined as technology has advanced (Bowker and Pritham 2004).

Causes of amputation

- Current demographic data are based on amputees referred to specialist prosthetic rehabilitation centres (Limbless-statistics, 2012).
- Currently there are no national data for all amputations performed in the UK, nevertheless it is estimated that a small number of primary amputees are not referred for prosthetic rehabilitation including amputees who have been assessed by health professionals where prosthetic mobility is considered unsafe or inappropriate.
- In some cases amputees choose not to achieve prosthetic mobility, irrespective of ability.

Consequently, according to Limbless-statistics, 2012 approximately 5000 amputations are performed annually in the UK and referred for assessment for prosthetic rehabilitation, with over 90% of these being lower limb (LL).

Context, United Kingdom

- The number of persons with amputation (the amputee) in the UK – 62 000 (Limbless-statistics, 2012) – is small relative to the total population, i.e. approximately 9 per 100 000, in comparison to approximately 180 stroke patients (per 100 000) (ONS, 1994–1998). The likelihood of every undergraduate student or novice physiotherapist experiencing amputee rehabilitation is therefore small.
- Most amputees receive early rehabilitation as in-patients in an acute hospital setting and form part of a physiotherapist's caseload that includes non-amputee patients. Depending on the cause of amputation the amputee may be managed on a surgical, orthopaedic or care of the elderly ward and this may be for a prolonged period. Exceptions to this are a vascular unit within a hospital or a specialist rehabilitation ward attached to a prosthetic rehabilitation unit in a disability service centre (DSC).
- Physiotherapists are well placed as key health professionals in amputee management since initial contact can be prior to amputation surgery, in the community or later in the care pathway at review and follow up of the 'established' amputee. Irrespective of the setting, guidelines recommend that physiotherapists specialised in amputee rehabilitation be responsible for the physiotherapy management of amputees (Broomhead et al 2003, 2006). A holistic multidisciplinary approach is advocated at all stages of rehabilitation from pre-operative assessment through to prosthetic discharge (Broomhead et al 2003, 2006). At all stages patients' and carers' wishes must be considered.
- Following amputation the common goal for most amputees is to achieve functional independence, ideally using a prosthesis. Amputees face many challenges, particularly physical and psychosocial ones which can change with age and acquired conditions affecting potential for rehabilitation, mobility and overall function (Schoppen et al 2003). Physiotherapy assessment is indicated at several stages during rehabilitation and at further and often unrelated times during the life of an amputee.

Assessment

Preoperative physiotherapy assessment

- Recommended where practicable, as this provides an opportunity to observe and note joint contractures, muscle weakness or gait deviations, often present if a patient has had a prolonged period of pain and immobility.
- The physiotherapist can demonstrate equipment, advise on exercises to reduce and/or prevent weakness and prevent contractures.
- Information gained from assessment can be shared with medical colleagues to facilitate the decision process regarding level of amputation and early post-operative management.
- This assessment also offers the potential amputee the opportunity to discuss any concerns and ask questions.

Postoperative physiotherapy assessment

- Usually performed routinely postoperatively, preprosthetically, as part of prosthetic rehabilitation, as part of prosthetic review or following further amputation surgery or acquired pathology.
- Aspects of the assessment are similar to other areas within a physiotherapist's scope of practice, e.g. an amputee with a musculoskeletal problem would have the same tests performed prior to local soft tissue treatment. An amputee with a neurological condition would have the same assessment of balance, tone and function as performed for a patient managed in a neurological rehabilitation setting.
- The interpretation of physiotherapy assessment defines the goals for treatment, including suitability for prosthetic rehabilitation.
- Ongoing evaluation involving the use of valid, outcome measures, is critical to achieving successful patient outcomes.

Prosthetic assessment

- Following surgery the majority of amputees are referred for prosthetic rehabilitation at their local DSC of which there are 43 in the UK.
- Most will receive their initial prosthetic treatment at the centre as outpatients and will continue their prosthetic rehabilitation at their local hospital or via community services.
- However not all amputees referred to DSC will be fitted with a prosthesis.
- Physiotherapy assessment findings contribute to the MDT decision regarding an amputee's suitability for this stage of rehabilitation.

General considerations

Age

- The incidence of lower limb amputation increases with age. The average age of a patient requiring a first amputation is 69; 28% of all new referrals to prosthetic centres in 2006 were over the age of 75.
- Unlike LL amputees, most UL amputees are in the younger age groups which reflects the aetiology of the condition, i.e. mainly trauma. Three in every five UL referrals were aged between 16 and 54 years (Limbless-statistics, 2012).

Gender

- The male to female ratio is approximately 3 : 2 (Limbless-statistics, 2012).

Levels of amputation

- The levels of amputation of the upper and lower limb are shown in Figures 2.1 and 2.2 and the incidence of the amputations at these levels is listed in Box 2.1.

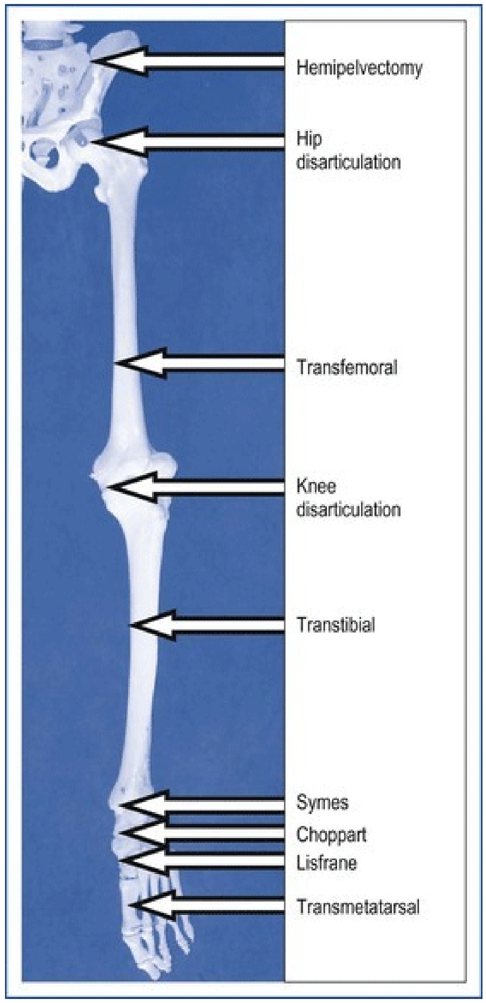


Figure 2.1 Levels of amputation in the lower limb.

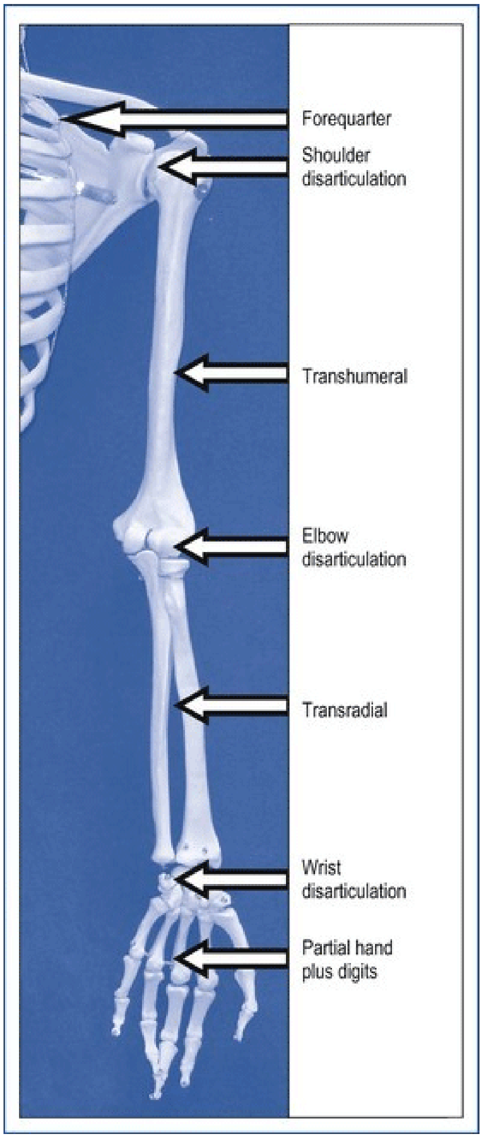


Figure 2.2 Levels of amputation in the upper limb.

Box 2.1 Causes and incidence of amputations in the lower and upper limb (Limbless-statistics, 2012)

Lower Limb (LL)

- 72% of LL amputations are caused by dysvascularity e.g. peripheral vascular disease and/or diabetes.
- 50% of patients with vascular disease have diabetes and account for a third of patients referred for prosthetic rehabilitation.

- Other causes of LL amputation include:
  - 7% Trauma e.g. RTA, conflict
  - 3% Neoplasia
  - 8% Infection e.g. meningococcal septicaemia
  - 3% Congenital deformity
  - 9% Other causes or no cause provided

Upper Limb (UL)

- Patients with (UL) amputation account for only 5% of the total amputee population, and the cause is mostly traumatic (53% of cases).
- Other causes of UL amputation include:
  - 11% Dyvascularity
  - 10% Neoplasia
  - 6% Infection
  - 1% Neurological disorder
  - 20% Other or no cause provided
- Congenital deformity accounts for approximately 3% of all patients with limb absence
- A total of 4,574 lower limb and 215 upper limb amputations were recorded in the United Kingdom in 2006/07.

Mortality

- Perioperative mortality rates are related to level of amputation, cause of amputation, age and co-morbidities (Engstrom and Van de Ven 1999).
- Recent figures from the Vascular Society of Great Britain quote a perioperative mortality rate ranging from 10% in transtibial amputees to 24% at transfemoral level.
- Data indicate 50–60% survival at 2 years and 30–40% at 5 years (vascular cause of amputation).

Additional information to consider

- Anatomy of the lower and upper limbs
- Vascular system
- Pathology of causes of amputation, associated conditions and complications including:
  - Peripheral vascular disease (PVD)
  - Cerebrovascular accidents
  - Myocardial infarction
  - Mesenteric (gut) infarction
  - Diabetic retinopathy and visual impairment
  - Diabetic neuropathy in hands and feet

- Renal disease
  - Additional trauma or associated injuries, e.g. burns, blast, compression
  - Elective amputation following trauma, e.g. following reconstructive orthopaedic management
- Specific investigations prior to amputation surgery:
  - Segmental pressure monitoring – uses pressure gradients to determine blood flow
  - Colour Doppler ultrasound – measures velocity of blood flow. Increased velocity indicates narrowing, zero velocity indicates occlusion
  - Magnetic resonance angiography
  - Angiography – use of injected contrast agent into artery (usually femoral) to enable imaging of vasculature to identify extent and level of vascular insufficiency to determine either further intervention or level of amputation
- Examples of vascular intervention (Beard et al 2009)
- Depending on the location and extent of the vascular disease the following may be options
  - Surgical or chemical sympathectomy
  - Angioplasty
  - Stenting
  - Embolectomy
  - Bypass grafts, e.g. femoral popliteal
- Amputation surgical techniques (Smith et al 2004), e.g.
  - The long posterior flap and skew flap at transtibial level
  - Anterior and posterior flap at transfemoral level
- Other investigations include
  - X-rays – can assist with decisions regarding level and length of amputation
  - Biopsy – tumour
- Pain – causes and influencing factors include, infection, joint pain, psychological (Engstrom & Van de Ven 1999; Ehde et al 2000; Hanley et al 2004, 2006)
- Gait, i.e. normal gait (Whittle 2007)
- Grieving process (Fischer 2009)
- Multidisciplinary team approach (Ham et al 1987; Stewart & Jain 1993; Pernot et al 1997)
- Prosthetics, i.e. basic examples and fit of prosthesis (Smith et al 2004).

Considerations immediately prior to undertaking an assessment

- Therapeutic setting.
- Type of surgical anaesthesia used – general versus spinal or chemical block.
- Primary or established amputee.
- Timing, e.g. postoperative, preprosthetic or prosthetic stage of rehabilitation, prosthetic review.

- Pain control. Ensuring that pain is adequately controlled will enable the amputee to engage effectively in the assessment process and allow the therapist to perform a thorough and accurate assessment.
- Therapy/MDT assessment approach, i.e. profession-specific or joint assessment (e.g. OT and PT). Joint assessments reduce repetition for the amputee and can enrich the quality of the information obtained.
- Next of kin and/or carers. In some instances it is necessary to seek permission from others, e.g. for children, vulnerable adults.
- Awareness of prior or associated assessments.
- Access to existing reports, e.g. home access visit. These can help target assessment questions.
- Environment, e.g. gym setting with adjustable plinth, ward and hospital bed, home.
- Patient to be suitably dressed for assessment.
- Removal of footwear to allow inspection of remaining foot.
- Acknowledge cause and associated physical problems, e.g. neural damage or fractures.
- Awareness of feelings of anxiety and loss, sadness and sometimes depression. There may be associated family or personal loss. In cases of severe trauma some amputees may experience post traumatic stress disorder (PTSD).
- Early identification of cognitive problems will influence the extent of assessment, goal setting, treatment plan and outcomes of rehabilitation. If not performing a joint assessment early referral to an occupational therapist or psychologist may be required.

Where to find important information

- Patient medical notes, current and past
- Prosthetic file in DSCs
- Reports/correspondence from referring colleagues, e.g. GP referral, home visit reports, social worker report, district nurse, school (e.g. paediatric amputee)
- Members of the amputee MDT
- Patient
- Next of kin/parents/carers.

Subjective assessment

- The approach will be similar to history taking in any of the core assessments.

Age and gender

History of present condition

- Date of amputation, cause and level

- History of investigations/surgery prior to amputation
- Mobility, function and social participation prior to amputation
- Co-morbidities and concurrent pathologies/injuries.

Past and relevant medical history

- Diabetes – diabetic control and management, previous healing rates; presence of diabetic peripheral neuropathy and/or glaucoma, renal disease.
- PVD – presence and manifestation of intermittent claudication; effects on remaining limb.
- Osteoarthritis – limitations of movement, joint replacement affecting pre-amputation mobility.
- Rheumatoid arthritis – active/burnt out; joint deformities; hand function will be important for ability to transfer and don a prosthesis.
- CVA – important factor in determining level of amputation and likely outcomes.
- THREAD (*T*hyroid disorders, *H*eart problems, *R*heumatoid arthritis, *E*pilepsy, *A*sthma or other respiratory problems, *D*iabetes).
- General health, e.g. recent weight loss/gain.
- Previous surgical history, e.g. vascular/orthopaedic reconstructive surgery, other amputation surgery or general surgery.
- Smoking/alcohol history.
- Vision.
- Hearing.

Drug history

- Current medication. Awareness of impact of specific medications on wound healing, exercise tolerance, mood, e.g. steroids, anticoagulants, diuretics, use of GTN, antidepressants
- Pain control, i.e. residual limb and/or phantom limb pain/other
- Allergies (e.g. dressings).

Psychosocial history

- This may be done in conjunction with occupational therapy colleagues
  - Home, e.g. accommodation, flat, house, stairs
  - Owner/rented accommodation
  - Occupation/financial situation, e.g. in need of advice regards entitlements and benefits
  - Interests and hobbies
  - Social support, i.e. family members, neighbours, community
  - Driving and transport

- – Pre-amputation level of mobility and function, e.g. premorbid use of walking aids
- – Cognition
- – Mood/motivation/mental health status, presentation, e.g. posture, willingness to engage with history taking and assessment process.

Pain history

- Back and/or neck pain
- Joint pain
- Neuropathic pain
- Other
- Amputees will routinely experience postoperative residual limb discomfort or pain (RLP)
- Amputees can also experience phantom limb sensation (PLS) which may be painful (PLP)
- Chronic residual limb pain is pain that continues for more than 6 months post amputation
- An amputee's response to pain can indicate acceptance or otherwise of amputation, adjustment to altered body image.

Objective assessment

Range of movement (ROM)

- Limited ROM (both UL and LL) will influence rehabilitation outcomes.
- Existing and presenting deformities and/or unstable joints proximal to the residuum and in the remaining limb will influence the potential for prosthetic use and mobility.
- The most common joint contracture (which may be 'fixed' or reversible) for transfemoral amputees is hip flexion, abduction and external rotation (Figure 2.3).
- Fixed flexion contracture deformity of greater than 25° can impact on prosthetic comfort, prosthetic prescription, mobility and energy expenditure.
- Flexion deformity of the knee in the transtibial amputee will influence prosthetic fitting, gait and function.
- It should be noted that skilled prosthetists and prosthetic technicians can modify a prosthesis to accommodate some degree of fixed flexion deformity and/or contracture.
- Prosthetic prescription can also accommodate some instability of the knee joint.
- Limited ROM in the upper limbs may compromise ability to perform activities of daily living (ADLs), transfers and restrict wheelchair mobility.

Figure 2.3 Fixed flexion deformity.

Muscle strength

- A grade less of than 4 (Oxford Scale Grading) (Medical Research Council 1976) in all major muscle groups in the upper and lower limb can influence the amputee's ability to achieve functional independence, e.g. to carry out ADLs, self propel a wheelchair, administer wheelchair brakes, transfer independently, and to stand from sitting and to walk.
- Weakness in the LLs will contribute to gait deviations.

Balance and co-ordination

- Poor balance and righting reactions may compromise mobility and function in terms of safety and is associated with an increased risk of falls.
- An inability to safely reach outside base of support will hinder functional tasks, e.g. to operate footplates, dress and undress and to transfer.

Proprioception

- This is dependent on amputation level, i.e. the higher the level the greater the loss of proprioception and balance influencing mobility, function and safety.

Comorbidities

- The presence of comorbidities, e.g. CVA, fracture, will influence the objective assessment and may indicate further specific therapy assessment. Comorbidities will affect treatment planning and outcomes.

Sensation

- Testing sensation of the remaining lower leg and residuum is especially important for

those amputees at risk of peripheral neuropathy, i.e. the amputee with PVD and/or diabetes (Potter et al 1998) (Figure 2.4).

- The amputee should be able to report any pressure or shear forces on vulnerable tissue areas on the residual limb and on the toes, metatarsal heads and heels of the remaining limb.
- Unreported and unresolved adverse pressure will result in the breakdown of skin and soft tissue that may develop into ulcers and delay the achievement of functional outcomes.

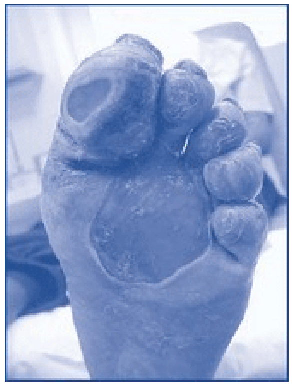


Figure 2.4 Ulcerated diabetic foot.

Reprinted from Foster A 2006, Podiatric assessment and management of the diabetic foot, published by Churchill Livingstone, with permission from Elsevier Ltd.

Pain

- Pain after amputation is common.
- The amputee may report RLP or PLP; however, phantom sensation can be painless.
- The presence of pain may influence the amputee's ability to engage in rehabilitation.
- Occasionally pain can become a long-standing problem.
- Objective measures to assess and evaluate RLP and PLP include visual analogue scales (VAS) and body charts (Fox and Day 2009).
- Palpation of the residual limb, e.g. for neuroma, and the assessment of ROM in proximal joints, including neck and back can assist in the diagnosis and management of RLP, PLP and/or coexisting pain presentations.

Prosthetic function and gait

- If the amputee is a prosthetic user the fit and alignment of the prosthesis must be assessed along with observational gait analysis.
- This aspect of assessment is likely to take place at prosthetic review, in anticipation of a new prosthetic prescription, due to additional pathology or following a fall.
- Additionally a range of incidents can prompt a referral (patient self referral, or via the

functional activities or the onset of pain.

MDT) to physiotherapy, e.g. loss of confidence, deteriorating ability to walk or perform functional activities or the onset of pain.

- Prior to observing and assessing amputee gait, routine aspects of assessment should be conducted and noted as findings may indicate the cause of gait deviations and/or difficulties.
- Prosthetic function and gait assessment include observing the prosthetic donning procedure, the fit of the prosthesis and routine functional activities such as sit to stand, walking (Figure 2.5) and stairs.
- Walking aids required must be noted along with apparent confidence and balance.
- The use of validated outcome measures should be incorporated into this assessment to provide objective benchmarking, e.g. Houghton scale, Timed Up and Go, Activities-specific Balance Confidence Scale – UK (ABC-UK) (BACPAR 2010, Condie et al 2006).

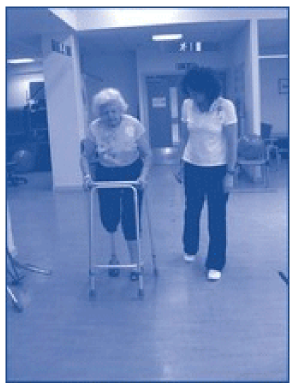


Figure 2.5 Gait observation.

Other considerations and observations

The residual limb

- Skin colour and condition, e.g. in the dysvascular amputee the colour of the residuum may be dusky, red or white and fragile. The residuum may be cool in temperature with poor vascular refill (i.e. blanching on pressure with slow return to normal skin colour). Skin may be thin and shiny with minimal or no hair growth. These observations, the presence of ulcers or a non-healing amputation wound, are indicators of poor vascularity and vulnerability to skin or wound breakdown.
- The presence of infection will compromise wound healing and predispose to tethered or adherent scarring affecting successful prosthetic fitting.
- Delayed wound healing will lengthen the period for rehabilitation and can affect the amputee's mood and motivation.
- Scarring, skin grafts or poor sensation will influence prosthetic prescription, mobility and function.

- Signs of skin irritation can indicate reaction to dressings, stump socks, prosthetic materials or poor personal hygiene.
- The shape and length of the residuum, the position of suture lines and scars, proximal joint deformities and/or bony prominences will impact on prosthetic socket shape and design, comfort and mobility.
- Oedema is a normal response to amputation surgery. Its control, reduction and evaluation will influence the progression of rehabilitation.

The remaining leg

- The same factors that relate to the vascularity of the residuum relate to the remaining leg and provide an indication of the viability, potential for weight bearing required for transfers and walking, and long-term outcome.
- The overall condition of the foot, e.g. joint, bone and/or skin changes, sensation, and the presence of suitable protective covering and footwear, are important factors for function and prosthetic mobility.
- Care of the remaining leg forms an important part of treatment (Figure 2.6).

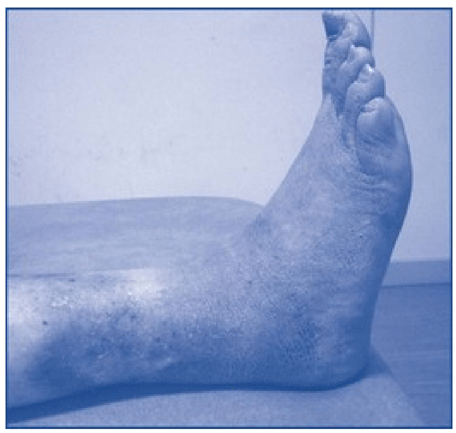


Figure 2.6 The remaining limb.

Cardiovascular (CV) and respiratory systems

- Prosthetic mobility demands an increase in energy expenditure and a need for increased exercise tolerance.
- Transfemoral amputees use more energy to walk than normals (Waters and Mulroy 2004).
- The prevalence of coexisting cardiovascular and/or respiratory disease in patients with dysvascular amputation is high and comorbid heart disease may prevent functional independence (Roth et al 1998).
- An ability to use a wheelchair and early walking aid (EWA) such as the pneumatic post-

amputation mobility aid (PPAM Aid) can indicate capacity to meet an increased energy demand.

Postural and facial characteristics

- Postural and/or facial effects may be indicative of pain, apprehension or depression, e.g. postural kyphosis may reflect an amputee's low psychological status with regard to acceptance of their loss and ability to engage in the assessment process.

Hand dexterity

- Poor hand dexterity (e.g. rheumatoid arthritis) will affect ADLs such as dressing, and the ability to donn and doff a prosthesis (Figure 2.7 – refer to Chapter 15 for more detail).

Figure 2.7 Hand deformity with rheumatoid arthritis.

Functional assessment of personal ADLs

- This provides information about the amputee's physical ability to carry out routine functional tasks, cognitive ability to problem-solve and learn new tasks – simple and more complex – and capacity to remember and retain information.
- These abilities contribute to the assessment for suitability for prosthetic mobility.
- Examples of ADLs include:
  - Transfers
  - Bed mobility
  - Ability to manoeuvre wheelchair
  - Independence with washing, dressing and eating.

Prosthetic referral

- Not every amputee is suitable for prosthetic rehabilitation and this is common with the older transfemoral amputee.
- There is a low success rate in terms of prosthetic function in the older amputee (Cumming et al 2006; Callaghan and Condie 2004; Davies and Datta 2003).
- It should be noted that if a decision is made not to refer a patient for prosthetic rehabilitation (by either the amputee or the MDT) this should be reviewed where circumstances change physically or psychosocially.
- Independent and safe wheelchair mobility is a positive outcome for many amputees and an important goal for physiotherapy treatment.
- To assist the decision-making process with respect to assessing an amputee's suitability for using a prosthesis, functionally and safely, there are some broad guidance criteria:
  - The residual limb wound should be healing – an unhealed wound is not a contraindication to prosthetic mobility, but may compromise prosthetic prescription
  - The amputee must be able to understand and remember instructions. This relates to safety and also the capacity for problem-solving and reasoning
  - The amputee must demonstrate independent transfers to and from a wheelchair – indicating safe ability to achieve independence with ADLs
  - Independent wheelchair mobility indoors – as above
  - The amputee must be able to push up from sitting to standing independently within parallel bars and maintain independent standing (with assistance of parallel bars) – this indicates levels of strength, endurance and balance
  - Wound healing permitting, the patient should be able to mobilise with an EWA, this challenges strength, balance, co-ordination and cardiovascular tolerance (see Condie et al 2011, Gailey et al 2002).

Additional specific factors that may influence prosthetic referral include

- A hip or knee flexion deformity greater than 25° can compromise prosthetic fit, comfort and stability.
- Hand dexterity required to don and doff prosthesis independently.
- Ability to wash and dress independently.
- Motivation, i.e. does the amputee want to walk?
- Does the amputee appreciate what is involved to achieve safe prosthetic mobility?
- Comorbidities.
- A premorbid history of falls.
- Poor social support.

Tip!

Where a prosthesis will not assist a transfemoral amputee to transfer, a prosthesis can

facilitate the transfer process in the case of the single transtibial amputee.

Objective testing

ROM and strength

- Assessment will follow that of a MSK physical assessment using goniometry and the MRC scale.
- Thomas's test is particularly important for assessing the true extent of hip flexion contracture (Figure 2.8).
- Observation of muscle wasting and tone will be an indicator of weakness, inhibiting pain or long-standing immobility.

Figure 2.8 Thomas's test for fixed flexion deformity.

Balance

- Formal validated tests for balance, e.g. Berg balance/TUAG/180° Turn test are not possible in the primary amputee without a prosthesis (Berg et al 1995).
- Functional Reach Test/Measure of Quads strength are objective measures of balance and risk of falls (Campbell et al 1997).

Tip!

An amputee's ability to move out of base of support, e.g. bend down to take off footwear or remove clothing from bottom half are good indicators of dynamic balance.

Sensation/proprioception

- Use of differentiation testing, e.g. temperature, light touch, pin prick are all useful tests

for assessing general sensation both on the residuum and remaining leg.

- For more in-depth assessment of the diabetic foot the use of a monofilament can provide useful evidence.
- Discernment of 10 points out of 10 is tested – failure to discern all 10 would indicate a foot at risk of being unable to detect pain or pressure and therefore at risk of ulceration and tissue breakdown (Abbott et al 2002).

Tip!

The inability to approximate the palmar surfaces, or make the 'Prayer' sign, can demonstrate limited joint mobility in other joints, e.g. the foot. This in turn can lead to increased pressures on the plantar aspect of the foot and if combined with a neuropathy can lead to ulceration (Goldsmith et al 2002).

Pain

- The nature and pattern of pain must be recorded. Questioning of pain presentation includes:
  - Residual limb or phantom
  - Distribution
  - Description, e.g. burning, stabbing, drawing, pins and needles, intermittent, constant
  - Intensity (VAS) and pattern over 24-hour period
  - Triggers, i.e. easing and aggravating factors, e.g. medications, exercise
  - Impact on socialisation and participation.

Additional assessment considerations for the bilateral amputee

HPC

- The reported long-term prognosis for single vascular amputees is the likelihood of losing the remaining leg within 3 years (Gonzales et al 1974).
- Mortality rates rise after 5 years following the first amputation (Engstrom and Van de Ven 1999).
- Whether the amputee has previously been a single amputee or has become a bilateral as a primary will be significant in their overall management.
- If originally a single amputee their outcome as a prosthetic user will be an important factor in assessment, subsequent treatment planning and potential outcome as a prosthetic user.

Energy expenditure

- Study findings vary in relation to actual figures of the increase in energy expenditure for walking, but the overall consensus shows an increase in energy cost as levels become higher (Waters and Mulroy 2004).

ROM

- The importance of maintaining hip and knee extension needs to be emphasised with the bilateral amputee in relation to facilitating transfers and for mobility.

Balance

- This is critical for a bilateral amputee's ability to transfer safely and independently for functional tasks, e.g. toilet transfers.
- Static and dynamic sitting balance must be assessed on varying surfaces, including low air-loss mattress and gym plinth.
- The more proximal the amputation the greater the loss of stability and challenge to balance.

UL and trunk strength

- The bilateral amputee will be reliant on good UL and trunk strength to enable independent transfers and self-propulsion in a wheelchair.

Complex trauma

- The combination of UL with LL loss will influence the assessment approach and the prioritisation of treatment interventions (Figure 2.9).

Figure 2.9 Complex trauma with multiple limb loss.

Assessment considerations for the UL amputee

HPC

- The most common cause of amputation in the UL amputee is trauma. Amputation may happen as part of the trauma itself.
- In some cases where limb salvage and reconstructive surgery have not achieved a successful outcome, elective amputation may be performed, e.g. where trauma is associated with a totally avulsed brachial plexus amputation, may be a choice where the arm remains flail and insensate.
- Patients with amputations as a result of infection (e.g. meningococcal septicaemia) often have multiple amputations involving UL and LL.

ROM, muscle strength, balance and proprioception

- The cervical and thoracic spines, the shoulder girdle and all joints proximal to amputation level in both arms should be assessed.
- In the bilateral UL amputee the neck, hips, knees and feet will be used in ADLs and therefore must be included in assessment.
- Restricted movement and strength will limit function, predispose to postural and gait deviations, affect balance, may contribute to discomfort or pain and will influence function and effective prosthetic use.

Observation of posture and gait

- The most common postural deviations observed in the UL amputee are internal rotation and adduction of the glenohumeral joint, restricted cervical rotation and side flexion, reduced arm swing in walking accompanied by thoracic side flexion to the amputated side (Figure 2.10).

Figure 2.10 Upper limb amputee posture.

Hand dominance. Functional assessment of ADLs

- In the case of the single UL amputee the remaining arm will become the dominant arm.
- Dexterity and ability to perform functional tasks must be assessed.

Pain

- The presence of discomfort or pain in either arm will influence independence with functional activities and prosthetic use.
- Pain in the remaining arm may be caused by overuse following initial trauma or amputation.

Psychological factors

- The loss of an arm has considerable psychological consequences.
- The hand is a significant factor in body image, personality, independence and livelihood (Carnegie 1999).

Treatment planning for the amputee

- A problem list and treatment plan, including agreed achievable goals, should be formulated in partnership with the patient (Broomhead et al 2006).
- Using a tool such as the International Classification of Functioning, Disability and Health (ICF 2010) model can assist the evaluation of the assessment findings (Geertzen 2008).
- The impact of physical, personal, social and environmental factors will influence the reality of attainable rehabilitation goals and will guide the treatment plan.
- Considering these together with assessment findings the physiotherapist can identify the amputee's main problems, discuss, agree and set goals to prioritise treatment planning.
- It is recommended that the 'SOAP' format is used for recording treatment.

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Recommended reading to accompany the amputee chapters and provide further information includes:

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Chapter 2

E-materials

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Author Profiles

Mary Jane Cole MSc GradDipPhys MCSP

Senior Lecturer, Practice Education, at Kingston University and St George's, University of London.

Mary Jane has worked in amputee rehabilitation in a variety of settings for many years, primarily at Queen Mary's Hospital, Roehampton, and continues to practise. She lectures nationally and internationally and has published in the speciality. Mary Jane has been Chair and Research Officer for BACPAR (British Association of Chartered Physiotherapists in Amputee Rehabilitation) and is currently Vice Chair and BACPAR representative to SPARG (Scottish Physiotherapy Amputee Research Group).

Sara Smith MCSP PGCertClinEd

GradDipPhys MCSP

Therapy Team Lead, Queen Mary's Hospital, Roehampton, London, United Kingdom.

Sara Smith has been involved in all aspects of amputee rehabilitation at Queen Mary's Hospital, Roehampton since 1987. She has been committed to the sharing of good practice through education and completed the Post-graduate Certificate in Clinical Education and subsequent ACE accreditation with the CSP. She lectures on the Roehampton 2-day and 4-day amputee rehabilitation courses and has presented at ISPO conferences and BACPAR study days.

Appendix 2.1 Amputees: glossary

ADLs – activities of daily living

Alignment (of the prosthesis) – the biomechanical set-up of the prosthesis to provide stability and as near normal gait pattern

Componentry – any part of the prosthesis below the socket, i.e. knee, ankle unit or foot

Compression sock – an elastic sock of varying lengths to aid oedema control. Brand names include 'Juzo' and 'Ottobock'

Doffing – removing the prosthesis

Donning – putting on the prosthesis

Established patient – an amputee who has completed initial rehabilitation and is returning for review for further prosthetic rehab or intervention/ therapy as appropriate

EWA – early walking aid, e.g. PPAM Aid

Femurett – early walking aid for the transfemoral amputee

Fitting – this is the appointment when the fit of the prosthesis is assessed by the prosthetist and adjustments are made as necessary before the amputee can walk with it

ICT – intermediate care team – also referred to in other terms

Liner – the inner and removable part of a socket

LL – lower limb

MSK – musculoskeletal

Multiple amputee – combination of upper and lower limb loss

Myodesis – surgical technique where the muscle groups are attached to the bone periosteum
PLP – phantom limb pain – a painful sensation in the phantom limb
PLS – phantom limb sensation – non-painful sensation in the phantom limb
PPAM Aid – pneumatic post-amputation mobility aid
PRAFO – pressure relieving ankle foot orthosis
Primary patient – a patient for whom this is their first episode of rehabilitation following amputation
Prosthesis – artificial limb
Prosthetic prescription – the type of limb selected to meet the amputee's needs
Prosthetics – artificial extension replacing a body part
Prosthetist – the health professional who makes and fits the prosthesis
Residual limb – the amputee stump
RLP – pain in the residual limb, i.e. stump
Residuum – the amputee stump
Sit-Fit – inflated balance cushion
SMART goals – specific, measurable, achievable, realistic and time framed
Socket – the part of the prosthesis that covers and supports the residuum
SRPs – short rocker pylons – short training prostheses for the bilateral transfemoral amputee
Suspension – the means by which the prosthesis maintains the correct position on the amputee
Stubbies – customised sockets, without componentry, with modified rocker ends to aid mobility; serve the same function as SRPs. The end of the socket can be shaped to accommodate the knee disarticulation level
UL – upper limb

Appendix 2.2

Clinical Competency Self-Rating Tool
Physiotherapy and Amputee Rehabilitation

Name...
Student: Year ....
HEI...

Post/Band ....
Hospital/Trust..
Date..

Competence is defined as "*the possession of the necessary skills, knowledge, attitudes, understanding and experience...required to perform in professional and occupational roles to a satisfactory standard within the workplace*" (Day 1995).

The purpose of completing this self-rating form is to help guide the learning process during your placement/ rotation. It will be a useful tool for your own reflection, and to guide you **and** your clinical educator/ supervisor when setting learning objectives.

Take a few minutes at the very **start** of your placement/ rotation to consider the list of attributes (with reference to 'knowledge' and 'skills') and, using the scale, judge your current levels in the areas. Attributes have been identified in relation to learning opportunities relevant to this area of specialty, and in relation to published practice guidelines (Broomhead 2003 & 2006).

You need to **revisit** this tool by completing a new form at an agreed time; e.g. **in preparation for halfway assessment/supervision**, and at **the end of your rotation/ placement,** or more frequently as appropriate. Following completion, compare forms – changes will indicate where learning has occurred and where further learning needs are required; this can guide your supervision and future learning objectives.

Amputee Rehabilitation

At this point in time rate your **knowledge** and understanding of:

	weak									strong
1. The causes of amputation	1	2	3	4	5	6	7	8	9	10
2. The principles of amputation e.g. investigations, levels, complications	1	2	3	4	5	6	7	8	9	10
3. The psycho-social aspects of amputation	1	2	3	4	5	6	7	8	9	10
4. The pre-operative management of the lower limb amputee e.g. assessment	1	2	3	4	5	6	7	8	9	10
5. The early post-operative management of the lower limb amputee e.g. assessment, oedema control, wound healing, prevention of infection, exercise therapy	1	2	3	4	5	6	7	8	9	10
6. Causes of pain, residual limb and phantom	1	2	3	4	5	6	7	8	9	10
7. The referral procedure to the limb fitting centre/DSC	1	2	3	4	5	6	7	8	9	10
8. The pre-prosthetic rehabilitation stage e.g. early walking aids, prosthetic prescription	1	2	3	4	5	6	7	8	9	10
9. The prosthetic rehabilitation of the lower limb amputee e.g. prostheses, gait analysis	1	2	3	4	5	6	7	8	9	10
10. The role (within the overall management of the amputee) of the										
Surgeon	1	2	3	4	5	6	7	8	9	10
Rehabilitation Consultant	1	2	3	4	5	6	7	8	9	10
Nurse	1	2	3	4	5	6	7	8	9	10
Physiotherapist	1	2	3	4	5	6	7	8	9	10
Prosthetist	1	2	3	4	5	6	7	8	9	10
Clinical Psychologist	1	2	3	4	5	6	7	8	9	10
Occupational Therapist	1	2	3	4	5	6	7	8	9	10
Social Worker	1	2	3	4	5	6	7	8	9	10
Dietician	1	2	3	4	5	6	7	8	9	10
11. Post-discharge management e.g. onward referral, review	1	2	3	4	5	6	7	8	9	10
12. Outcome measures (in relation to amputee rehabilitation)	1	2	3	4	5	6	7	8	9	10

Please see over…

At this point in time rate your **skills** and ability with:

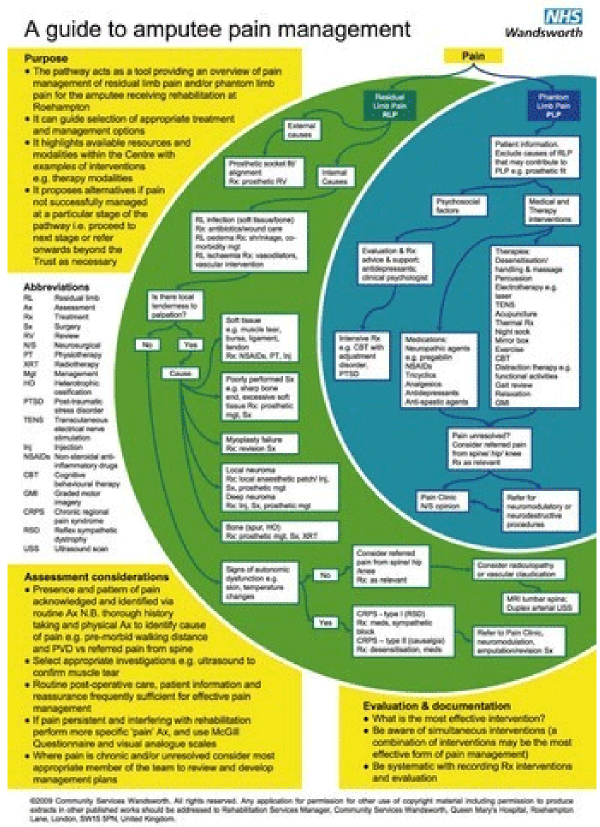
	weak					strong				
1. Examination and assessment of patients:										
pre-operatively	1	2	3	4	5	6	7	8	9	10
post-operatively	1	2	3	4	5	6	7	8	9	10
pre-prosthetically	1	2	3	4	5	6	7	8	9	10
prosthetically	1	2	3	4	5	6	7	8	9	10
2. Setting appropriate and realistic goals of treatment	1	2	3	4	5	6	7	8	9	10
3. Recognising the indications for oedema control	1	2	3	4	5	6	7	8	9	10
4. Recognising the indications for early walking aids	1	2	3	4	5	6	7	8	9	10
5. Recognising complications	1	2	3	4	5	6	7	8	9	10
6. Evaluating and progressing patients	1	2	3	4	5	6	7	8	9	10
7. Equipment handling:										
Wheelchairs	1	2	3	4	5	6	7	8	9	10
Early walking aids e.g. ppam aid	1	2	3	4	5	6	7	8	9	10
Walking aids e.g. sticks	1	2	3	4	5	6	7	8	9	10
8. Patient handling:										
Transfers	1	2	3	4	5	6	7	8	9	10
Treatment	1	2	3	4	5	6	7	8	9	10
9. Pain and its management	1	2	3	4	5	6	7	8	9	10
10. Falls advice and strategies	1	2	3	4	5	6	7	8	9	10
11. Psychological support to patients and carers	1	2	3	4	5	6	7	8	9	10
12. Problem-solving e.g. challenging and complex patients	1	2	3	4	5	6	7	8	9	10
13. Gait analysis	1	2	3	4	5	6	7	8	9	10
14. Advanced prosthetic rehabilitation e.g. 'free' knee componentry, running	1	2	3	4	5	6	7	8	9	10
15. Management of the bilateral lower limb amputee	1	2	3	4	5	6	7	8	9	10
16. Management of the non-prosthetic amputee	1	2	3	4	5	6	7	8	9	10
17. Management of the upper limb amputee	1	2	3	4	5	6	7	8	9	10
18. Effective communication with other members of the MDT	1	2	3	4	5	6	7	8	9	10
19. Discharge procedure	1	2	3	4	5	6	7	8	9	10
20. Information-giving to patients/clients and carers regards the rehabilitation process	1	2	3	4	5	6	7	8	9	10
21. Evaluating and developing the service for this patient/client group	1	2	3	4	5	6	7	8	9	10

Are there any other areas, related to the management of the amputee, in terms of knowledge, skills and ability, that you feel have the potential for change and improvement? Please state and rate accordingly

	1	2	3	4	5	6	7	8	9	10
	1	2	3	4	5	6	7	8	9	10
	1	2	3	4	5	6	7	8	9	10

Broomhead, P., Dawes, D., Hale, C., Lambert, A., Shepherd, R and D. Quinlivan. 2003. *Evidence Based Clinical Guidelines for the Physiotherapy Management of Adults with Lower Limb Prostheses.* Chartered Society of Physiotherapy, London.
Broomhead, P., Dawes, D., Hancock., A., and A. Davies. 2006. *Clinical Guidelines for the pre and post operative physiotherapy management of adults with lower limb amputations.* Chartered Society of Physiotherapy, London.
Day M. 1995. Putting vocational training into practice. Cited in Alsop, A. 2000. Continuing professional development. A guide for therapists. Oxford: Blackwell Science Ltd.

Appendix 2.3



Appendix 2.4 Transtibial prosthetic checkout

Check with patient standing and walking

1. Is the prosthesis the correct length?
2. Suspension
   - Is piston action minimal when the patient raises the prosthesis?
   - If a PTB – are the down-straps tight enough and does the cuff strap maintain its position?
   - If an Iceross – is the sleeve donned correctly?
   - If a No 8 or AK/BK pylon:
     - Does the thigh corset close properly, with adequate provision for adjusting corset tension?
     - Do the uprights conform to the flares above the epicondyles?
     - Do the length and construction of the thigh corset appear to be appropriate for its intended function of weight-bearing or stabilisation?

3. Anteroposterior alignment – The patient should not feel that his/her knee is unstable nor that his/her knee is being forced back.
4. Mediolateral alignment – The shoe should be flat on the floor and there should be no uncomfortable pressure at the lateral or medial brim of the socket.
5. Comfort:
    - Is the patient comfortable in the socket?
    - What is the patient's 'Socket Comfort Score (SCS)'?

Check in sitting

- Can the patient sit comfortably with the minimal bunching of soft tissues in the popliteal region when the knee is flexed to 75°?

Check with prosthesis off

- Does weight bearing appear to be distributed over the proper areas of the residual limb?

Appendix 2.5 Transfemoral prosthetic checkout

Check in standing and walking

1. Does the ischial tuberosity rest properly on the ischial seat?
2. Is the adductor longus tendon properly located in its channel and is the patient free from excessive pressure in the anteromedial aspect of the residual limb?
3. Is the anterior wall high enough to support adductor tissues?
4. Is the prosthesis the correct length?
5. Is the patient free from vertical pressure in the area of the perineum?
6. Is the patient comfortable in the socket? What is the patient's 'Socket Comfort Score (SCS)'?
7. Suspension:
    - For Rigid Pelvic Band (RPB) – does the pelvic band accurately fit the contours of the body?
    - For Silesian suspension – are the lateral and anterior attachments of the belt correctly located?
    - For other soft suspension – is there any drop away or rotation when walking?
    - For total-contact socket (suction):
        - is the valve located to facilitate pullout of the sock and the manual release of pressure?

– when the valve is removed, does tissue protrude into the valve hole with no gapping?
– is suction maintained while walking?

8. Gait and alignment – are there any of the following deviations?
   - Abducted gait
   - Circumduction
   - Lateral trunk shift
   - Medial whip
   - Lateral whip
   - Uneven heel rise
   - Terminal swing impact
   - Foot slap
   - Uneven length of steps
   - Vaulting.

Check in sitting

1. Does the socket and limb remain in good alignment?
2. Can the patient remain seated without a burning sensation in hamstring area?
3. If total-contact socket – can the patient rise to a standing position without objectionable air noise from the socket?

Appendix 2.6 User groups information

The Limbless Association:

http://www.limbless-association.org/
The UK Limb Loss Information Centre:
http://limblossinformationcentre.com/

Limbcare:

http://www.limbcare.org/

All websites accessed 2 August 2011.

Case Study 2.1

The classic borderline patient

- James, transfemoral amputee.
- Age: 75 years.

Significant points from PMH

- Chronically infected (R) TKR with significant pain.
- Mobility limited to 25 m, using 1 stick, unable to do stairs.
- Short transfemoral residuum to ensure clearance of the infection.
- Several transient ischaemic attacks (TIAs) resulting in (R) sided weakness, hand tremor, mild cognitive impairment and expressive dysphasia.
- Small vessel disease observed on head CT scan.

Significant points from assessment following amputation

- Needing assistance of 1 for bed mobility, transfers, ADLs and sit to stand.
- 10° flexion contracture of the right hip.
- Weakness of residuum in all major muscle groups, MRC 4.
- MRC 4+ in the muscle groups around the (L) hip and (L) knee flexors.
- Poor dexterity of (R) hand, with limited function regards dressing, e.g. buttons and zips.

Identified goals and treatment plan

James did not meet the borderline criteria, but had potential for rehabilitation and improvement, was motivated and understood the implications of the goals that were set to assess his suitability for prosthetic rehabilitation.

Goals set to enable prosthetic rehabilitation

1. To achieve independence in bed mobility, transfers, sit to stand.
2. Trial with Femurett and achievement of independent mobility within the parallel bars

Week.1, daily treatment

- General PIRPAG and strengthening exercises concentrating on right hip extension.
- Graded transfer practice:
  - Sliding board and wheelchair, with side removed
  - Progressed to wheelchair side removed
  - Progressed to standing pivot transfer, requiring good push up from sides of wheelchair or plinth and strong quadriceps to enable clearance of side of

wheelchair.

- Graded sit to stand practice:
  - Raised plinth with a second plinth in front for support
  - Progressed to decreased height of plinth to progress ability
  - Progressed to pushing up from plinth, without using second plinth for support
  - Progressed to sit to stand from wheelchair within parallel bars, pushing up from wheelchair.

Week. 2, daily treatment

- Goal 1 had been achieved.
- Continued with treatment approach from first week, with the addition of mobility using Femurett within parallel bars.
- Preparation for mobility:
  - Weight transference exercises, e.g. stepping up onto block with (L) leg
  - Use of mirror to facilitate symmetry and good posture
  - Practice of hip hitching in stance.
- Mobility within parallel bars:
  - Starting with (L) leg leading
  - Verbal cues for short prosthetic stride and step through with (L) leg
  - Manual facilitation to encourage extension and control of the Femurett
  - Close supervision until patient was able to control Femurett independently.

Week 3

Patient had achieved the goals and met the criteria for prosthetic rehabilitation.

Outcome

- James achieved independence in donning his prosthesis with the aid of velcro fastenings and some assistance from his wife.
- He progressed to mobilising short distances using a rollator frame indoors.
- His rehabilitation took a further 6 weeks.

This case study highlights the importance of having identified criteria to work towards and how these may be used to inform goal setting.

Case Study 2.2

The complex multiple limb amputee

- Fiona.
- Age: 25 years.
- Prior to illness Fiona had been a very active person and presented as being very motivated.

HPC

- An acute onset of meningococcal septicaemia, resulted in 4 limb compartment syndromes.
- These had to be treated surgically by fasciotomies to all 4 limbs.
- The fasciotomies were not successful and Fiona underwent bilateral transtibial amputations, amputations of the (R) MCPJ index through to little fingers and (L) DIPJ index through to ring finger.
- Both thumbs were left intact.

Identified problems from assessment

- Unhealed areas on (R) upper limb with new grafted skin on all limbs, fragile and vulnerable to breakdown.
- 45° flexion deformity of (R) elbow and impaired (R) wrist extension impacting on ADLs, e.g. transfers, sit to stand and use of walking aids.
- Oedematous, scarred transtibial residuums.
- Global muscle atrophy and weakness of upper and lower limb muscle groups.
- Loss of independence with ADLs, due to partial hand amputations.
- Loss of mobility and participation in previous sporting and leisure interests.

Early rehabilitation goals and treatment options

- Promotion of healing:
  - Close liaison with other members of the MDT was vital for this goal.
  - Working with dieticians, nursing staff and specialists from plastics dressing clinic provided a framework within which physical rehabilitation could occur without putting the fragile skin at risk of damage.
- Treatments included:
  - Use of pressure garments, moisturising regimen
  - High-calorie diet with supplements
  - Exercise programme to maintain range of movement and improve circulation and promote healing.
- Manage and reduce residuum oedema:

- Fiona was unable to use early walking aids as a bilateral amputee
  - Use of compression therapy, exercises, stump boards to control oedema.
- Increase power and range of movement in upper and lower limbs and preparation for mobility.
- Initially, Fiona quickly fatigued and treatment concentrated on achieving functional tasks, e.g. forward and backward transfers on and off all surfaces, bed mobility and learning how to manage her own personal care.
- As her exercise tolerance progressed she was able to engage in a daily exercise programme which consisted of:
  - Use of PIRPAG exercises for lower limbs and passive stretches to elbow and wrist
  - PNF techniques, e.g. double arm patterns for upper limbs and trunk
  - Core stability programme. This was progressed from exercises on a plinth to use of a gym ball, with Fiona sitting and then lying prone over the ball
  - Graduated resisted exercises with Thera-Band, weights, use of resistive equipment
  - Fiona was unable to use early walking aids, to enable early mobility
  - Exercises in 4 point, progressing to 2 point kneeling, to prepare for standing. These exercises were given to challenge balance and increase exercise tolerance with a progression to the upright position
  - Progression to 'Walking on knees' on mats, beside plinth, progressing to moving around a gym ball.

These treatments and the progressions enabled Fiona to prepare for and be successful with her prosthetic rehabilitation when her residuums were ready for prosthetic fitting.

Case Study 2.3

The pain patient

- Susan, transtibial amputation.
- Age: 49 years.

HPC

- Susan fractured her (R) ankle which was internally fixated and following problems this was subsequently fused.
- Susan is experiencing poor mobility and high levels of pain.
- It was agreed to carry out an elective transtibial amputation.
- The amputation went well and following successful rehabilitation using a patella tendon-bearing prosthesis Susan returned to work in a special needs school.
- I year later she began experiencing pain in the residuum, which led to her having reduced

mobility levels and being unable to work.

Management of and investigations for residual limb pain

To identify the causes of her symptoms the team used the pain pathway to help guide interventions (Figure A2.3.1)

RLP or PLP = RLP
↓
External or Internal causes
↓
External: New prosthesis manufactured to ensure correct socket fit
Internal: No infection, good vascularity
↓
Tender to local palpation – yes
↓
Likely cause due to location is neuroma
↓
Differential diagnosis made through U/S scan and then injection into neuroma which relieved Susan completely of her pain for 6 weeks
↓
Final intervention was the surgical removal of the neuroma.

Physiotherapy interventions during this process

- Desensitisation techniques to reduce sensitivity.
- Oedema control techniques to ensure stable volume and therefore correct socket fit, including the use of a compression sock and instructions to reduce hopping with crutches.
- To achieve the successful outcome a full MDT assessment of her problems was needed, which enabled Susan to return to her previous successful level of mobility and function.

Chapter 2 Amputees: multiple choice questions

1. What is the most common cause of amputation in the UK?
   a). Trauma
   b). Dysvascular
   c). Type 2 diabetes
   d). Infection

2. Which of the following amputations is recommended for a non limb wearer with no possibility of transfers?
   a). Transtibial
   b). Knee disarticulation
   c). Transfemoral
   d). Hip disarticulation
3. Which investigation does not determine amputation level?
   a). Angiography
   b). Joint ROM
   c). Neurological assessment
   d). Muscle strength
4. Which level is the stump board a useful part of oedema control?
   a). Transtibial
   b). Transfemoral
   c). Transtibial and knee disarticulation
   d). Transfemoral and knee disarticulation
5. When should the amputee be encouraged to start desensitisation of their residuum?
   a). From day 1
   b). When stitches are removed
   c). When residuum is healed
   d). When they are ready
6. Which of the following would be an extreme caution to use of the PPAM Aid?
   a). Unhealed residuum
   b). Phantom pain
   c). An ischaemic wound
   d). Ulcer on remaining limb
7. Which of the following is a pathway for phantom pain management?
   a). Preoperative epidural; postoperative medication; postoperative desensitisation; night sock
   b). Postoperative medication; postoperative desensitisation; night sock; exercise and compression therapy
   c). Postoperative medication; postoperative desensitisation; exercise and compression therapy; psychological support
   d). All of the above
8. Which of the following would not influence referral for prosthetic rehabilitation?
   a). Ability to process information
   b). Length of residuum
   c). Independence with wheelchair
   d). Pain
9. What pressure should the PPAM Aid be inflated to?
   a). 30 mmHg
   b). 40 mmHg

c). 50 mmHg
d). 60 mmHg

10. What is the most common contracture in a transfemoral amputee?
a). Knee flexion of remaining limb
b). Hip flexion of remaining limb
c). Hip flexion of residuum
d). Hip abduction of residuum

11. Which of the following is not a method of prevention of contracture for an amputee?
a). Joint stretches
b). Wheelchair stump board
c). Prone lying
d). Pillow under knee in bed

12. What is the most common amputee gait deviation?
a). Decreased stride length of remaining limb
b). Decreased stride length of prosthetic side
c). Abducted gait
d). Vaulting of remaining limb

13. What would be the most significant influence on the balance of a bilateral amputee?
a). Height
b). Equal length of residuums
c). Muscle strength
d). Core stability

14. At which level is a hip flexion contracture the most problematic?
a). Transtibial
b). Knee disarticulation
c). Transfemoral
d). Bilateral transtibial

15. Which of the following levels of amputees is the prescription of a prosthesis for transfers only useful?
a). Single transtibial amputee
b). Single transfemoral
c). Single transtibial and single transfemoral
d). Single transtibial and bilateral transtibial

16. Which of the following would not be a contraindication to prosthetic use?
a). Infected exudate
b). Dry scab with erythema
c). Dehiscing wound
d). Cold, ischaemic residuum

17. Which of the following amputations is able to weight bear on the end of their residuum?
a). Transtibial
b). Transfemoral
c). Knee disarticulation

d). Hip disarticulation

18. When assessing a diabetic amputee what is the most common sign and symptom that impacts on prosthetic rehabilitation?
    a). Muscle weakness
    b). Poor proprioception
    c). Distal neuropathy of remaining foot and residuum
    d). Pain
19. What advice would you give an elderly primary amputee if they needed to ascend and descend stairs pre-prosthetically?
    a). To hop using banisters
    b). To hop using crutches
    c). Backward chaining
    d). Not to do them
20. For the diabetic amputee which MDT member is key to their prosthetic mobility?
    a). Medical social worker
    b). Psychologist
    c). Orthotist
    d). Dietician

Amputee rehabilitation multiple choice answers

1. b) NASDAB statistics 2007
2. b) This provides improved sitting balance and a weight-bearing residuum if needed to aid transfers. A transtibial residuum can become contracted and have potential for breakdown or injury
3. d) This can be improved. Angiography will determine potential for healing; FFD at hip or knee can determine level – FFD of knee is a contraindication to a transtibial amputation; increase tone in a stroke patient affecting potential amputation side would prohibit a transtibial amputation and decreased or absent sensation in the diabetic patient can influence level
4. c) If the knee disarticulation residuum protrudes over the end of the cushion and is unsupported, oedema can accumulate and cause discomfort
5. a) Early handling will start process of desensitisation and is not detrimental to the residuum
6. c) SPARG guidelines
7. d)
8. b)
9. b) (Dawson et al 2007)
10. c)
11. d)
12. a)
13. a) Decreasing amputee height lowers the centre of mass (COM) improving balance (Gailey & Clark 2004)

14. b) The effect of hip flexion deformity on prosthetic alignment is exacerbated with this long lever and can cause great problems with gait re-education
15. d)
16. d) Infection can be treated and managed during rehabilitation; dehiscing wound can be managed under the 'Manchester protocol' (Van Ross et al 2009). A cold ischaemic residuum will be painful, may break down and need revision surgery
17. c)
18. c) This will impact on proprioception, balance and the overall management of the amputee
19. c) Safest method
20. c) Orthotic management of the remaining foot is key to safe and successful mobilisation

Chapter 3

Aquatic Physiotherapy

Introduction

- Aquatic physiotherapy, despite perhaps being the most ancient therapy, is also a contemporary therapy for the modern world.
- A five-year plan published by the Government encompassing the period 2010–2015 emphasises the need for a more preventative, people-centred and productive National Health Service (DOH 2009).
- Modern aquatic physiotherapy involves people who otherwise are likely to be inactive or not regularly involved in exercise (Jackson et al 2004), is suitable for all (Epps 2009), focuses on the individual and can be exceptionally cost-effective (HyDAT, 2009, Maynard 2003).
- Thus aquatic physiotherapy can be argued to be extremely relevant to the future delivery of an efficient and effective health care service.
- Historically, early religious practices in many cultures emphasised the healing powers of water, for example, the Babylonians, the early Hebrews, and ancient Indians.
- The Greco-Roman civilisation made many claims of water treatment and the Romans centred their social lives on their baths. The collapse of the Roman Empire led to a decline in medical and social bathing.
- Immersion in water re-emerged briefly in the Middle Ages in Europe and then again in the 17th century in England (Alder 1983).
- By the mid 20th century many British doctors rejected spa treatment as being unscientific, but it continued to thrive in much of Europe (Kersley 1982).
- Despite the negative opinions of some regarding the benefits of water-borne treatment, from the 1930s onwards the Chartered Society of Physiotherapy (CSP), with the support of rheumatologists, began to train physiotherapists to use water baths as a treatment for rheumatism (Skinner and Thompson 1983).
- This was the beginning of modern aquatic physiotherapy, which can be defined as:

  'A physiotherapy programme utilising the properties of water, designed by a suitably qualified physiotherapist. The programme should be specific for an individual to maximise function, which can be physical, physiological, or psychosocial. Treatments should be carried out by appropriately trained personnel, ideally in a purpose built, and heated Aquatic Physiotherapy pool' (ATACP 2009).

- Thus in contemporary health care provision aquatic physiotherapy should form an integral part of a rehabilitation programme and more broadly be considered as a part of

the patient pathway.

- It may be used as the only form of treatment being offered at that time, or may form part an overall treatment plan, designed to be complementary to other aspects of a person's planned treatment programme.
- Aquatic physiotherapy is often considered when all other forms of medical and physiotherapeutic intervention have failed.
- During the initial assessment of a patient consideration should be given to the inclusion of aquatic physiotherapy as a primary option in the management of a wide variety of conditions.
- Modern therapists need knowledge and skills to use this treatment safely and effectively (ATACP 2006). To ensure this, the ATACP run a foundation programme for chartered physiotherapists (ATACP 2010).

Assessment

- The main aspects of the assessment for aquatic physiotherapy are the same as many of the specialist areas within the physiotherapy scope of practice. For example a patient being assessed for a musculoskeletal problem would have the same tests performed for aquatic therapy as would be carried out prior to local soft tissue treatment, exercise or advice on land.
- A patient with a neurological condition would have the same assessment of balance, tone or function as they would prior to land treatment.
- It is recommended that the 'SOAP' note-keeping format is used, and that outcome measures appropriate to the condition are utilised.
- As an alternative the 'Measure it Yourself Medical Outcome Profile' (MYMOP) has the advantage of being non-condition-specific and easily used for most patient groups. It is a commonly used outcome measure across aquatic physiotherapy services in the United Kingdom (Paterson 1996).
- It is important to clinically reason why treatment in the pool should be the treatment of choice. Ask the question 'Why water?' (Can the patient be treated more effectively, more easily, or more appropriately in water than on dry land?).
- Without a sound knowledge of the physical properties of water, and the skills to utilise those properties to create effective treatment techniques this question is difficult to answer.
- A part of this chapter concentrates on the relevant physical properties, to assist the reader to be able to form reasoned decisions in this area.
- Knowledge of how a patient's body build or presenting condition can alter their behaviour in water is also vital.
- It is also important to have a clear understanding of the physiological changes that occur when a human body is immersed in water, as these form a large part of the screening process to ensure that the patient is safe to enter the pool.

- In addition, the person's 'confidence' in water needs to be assessed, both prior to and during the initial stages of treatment. Apart from asking the patient if they are happy in water, it is possible to observe clues such as the patient gripping onto the rails tightly, with a marked reluctance to let go, pulling themselves along the rail as they are laid back in water, or a reluctance to put their head or face near the water surface.

The physical properties of water

- The relevant properties physiotherapists need to be aware of to ensure that patients are appropriately referred and effectively treated in a pool are:
  - Hydrostatic pressure
  - Relative densities of water compared to other materials
  - Buoyancy
  - The metacentre
  - Turbulence
  - Refraction.

Hydrostatic pressure

- Hydrostatic pressure is created by the weight of water pressing down from above, and acts in all directions at right angles to any solid surface it is in contact with, e.g. the pool walls or patient's body.
- It follows Pascal's principle that this pressure is transmitted equally and undiminished in all directions through any fluid within a confined space (Brody and Geigle 2009).

$$\text{Pressure} = \text{Force} / \text{area}$$

i.e. the weight bearing down on a given spot.

– Pressure at the water surface is known as atmospheric pressure and equals 101 kilopascals (kPa).

– Pressure at 1 metre depth = 111 kPa

– Pressure at 2 metre depth = 121 kPa

– Pressure at 10 metre depth = 201 kPa

- In real terms this means that the human body standing in water up to their sternal notch will have a pressure of 120 g/cm^2 being exerted on their calf region. This is equivalent to the application of a tight crepe bandage.
- There is 10 times more pressure on the ankles in water at 1 metre depth, than at the water surface.
- The main consideration therapeutically should be in relation to the physiological changes that occur in the patient's body during immersion.

Density

Density = mass / volume

i.e. the number of molecules in any given space.

Relative density

- This is the density of any object or substance relative to the same volume of water at 4 °C (the temperature at which water is most dense).
- Water has a density of 1.000 kg/m^3 – (I litre of water at 4°C weighs 1 kg).
- The average human body with air in the lungs has a relative density of 0.975, so will float with 2.5% of its volume out of the water (Brody and Geigle 2009).
- This relationship changes throughout life:
  - A baby is less dense (0.860 kg/m^3) so will float with 14% of its body out of the water.
  - As muscle bulk increases so the body becomes more dense (0.975 kg/m^3).
  - As muscle and bone bulk decreases in later life, so the body becomes less dense again (0.860 kg/m^3).
  - Males tend towards greater muscle bulk, so float less readily.
- Salt water has a density of around 1.024 kg/m^3, so a body will float with a greater proportion out of the water.
- Anything less dense than water will float, while anything more dense will sink.
- Densities of different substances (kg/m^3)

Air	0.00125
Cork	0.22
Wood	0.75
Iron	7.7
Gold	19.3
Body Fat	0.92
Muscle	1.058
Rib bone	1.383
Tooth	2.24

- As can be seen different parts of the body will behave differently in water due to their differing relative densities, the limbs will tend to sink while the trunk will tend to be more buoyant.

Buoyancy

- This is the 'Upthrust' effect of water acting on a body, and depends on both the relative density of the object, and the hydrostatic pressure forces being exerted upon it.
- It is governed by Archimedes' principle. This states that 'When a body is wholly or partially immersed in a fluid at rest it will experience an apparent weight loss equal to the weight of the fluid displaced.'
- In other words if you get into a pool of water and the water level rises by 1 inch, if you could weigh that inch of water you would know how much apparent weight relief you were experiencing.
- As a guide for a person standing, immersion to the anterior superior iliac spine gives 50% weight relief, to the xiphisternum 70% weight relief and to C7 90% weight relief (Harrison and Bulstrode 1987).

Stability in water

- An immersed object is subject to two opposing forces
  - Gravity acting downwards
  - Buoyancy acting upwards.
- The object's shape, distribution of mass, and density determine its stability.
- When the result of all forces acting on a body equal zero; the body is said to be in equilibrium.

Centre of buoyancy (COB)

- This is the single point in an immersed object around which the buoyancy (upthrust) forces act.
- This point is the centre of gravity of the shape of the displaced fluid (i.e. its centre of gravity), and is therefore not a fixed point.
- This point moves as the attitude of the immersed body changes.
- In a body at rest it is slightly superior and anterior to the centre of gravity.

Moment of inertia

- A measure of an object's resistance to changes to its rotation.
- Initiation of rotation is harder in objects with a long radius.

Metacentre (turning forces in water)

- The metacentre is the midpoint at which a body can be held in perfect balance.

- The term 'metacentre' is not really important, but the effects it has are.
- It is the naval term given to the resultant restoring or stabilising torque (twisting force) when the forces of gravity and buoyancy acting on an immersed object are not in the same vertical plane.
- For the human supine in water with arms at the side, the body will be stable side to side (forces of gravity and buoyancy in line).
  - Take the right arm out to the side – the centre of gravity (COG) will move to that side, as will the centre of buoyancy (COB). As the arm is relatively dense however (being predominantly bone and muscle), the COG will move further than the COB, so rotational forces will tend to turn the body in that direction.
  - If that same arm is lifted out of the water, then the full force of gravity is then imposed on that arm. The COG therefore shifts over to the right, and because there is more 'shape' on the left, the COB moves to that side, the body will turn to the right.
  - If the right arm is crossed over the body, then the COG moves to the left, and the COB to the right and the body rolls to the left (Figure 3.1a and b).

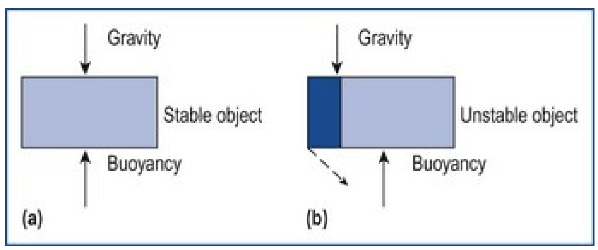


Figure 3.1 (a) Lines of gravity and buoyancy are in line. The object is therefore stable. (b) Line of gravity has shifted to the denser (left hand) end. The object is unstable, and will roll in the direction of the arrows until the opposing forces are once again in line.

Some factors that alter stability in water

'Shape' of the patient

- A person of very slight build will have the centre of buoyancy close to that of the centre of gravity. So in standing will tend to be more stable.
- The same applies to the more heavily muscled patient, they will tend to be 'leg heavy' with the legs sinking till they rest on the pool floor.
- A person with a large amount of adipose tissue around the abdomen will have a COG that is higher and more anterior, so they will have a tendency to rock backwards more, with legs that float up more readily.
- A person with physical deformity such as a lateral scoliosis will tend to roll in the water when supine due to the alteration of the position both of the centres of gravity and

buoyancy.

- A person with osteoporosis in the lower limbs will float with the legs high, and may even lay with their face immersed when supine unless some sort of buoyancy is applied around the neck/head area.

Surgery

- Orthopaedic surgery involving the use of metalwork, e.g. a total hip replacement, will make the patient float low on the side of the surgery, due to the greater relative density of the metal compared with the bone it replaces.
- Amputation of a lower limb will tend that patient to float high on the amputated side due to the loss of a relatively dense structure.

Depth of the water

- Water at S2 level – posture predominantly controlled by gravity.
- Water at T11 level – posture controlled equally by gravity and buoyancy.
- Water at C6/7 – posture predominantly controlled by buoyancy.
- It is more difficult to maintain balance in deeper water, so adopted stable positions facilitate the control of these turning forces, e.g. if you start to topple backwards then tilting the head slightly forwards, or bringing the arms forwards can help to correct the imbalance.

Hydrodynamics (fluids in motion)

- Hydrodynamics are the effect of movement in water, and largely follow Bernoulli's equation that

$$\text{Kinetic energy} + \text{potential energy} + \text{pressure energy} = \text{constant}$$

- Even the act of moving through the pool towards your patient will start the water itself moving, and therefore there will be flow.
- There are two types of flow (Brody and Geigle 2009).

Laminar flow

- This is low velocity, with all the water layers moving at the same speed. The flow is in smooth straight lines and has very little friction with a very small amount of turbulence behind the moving object (and therefore minimal energy loss) (Figure 3.2).

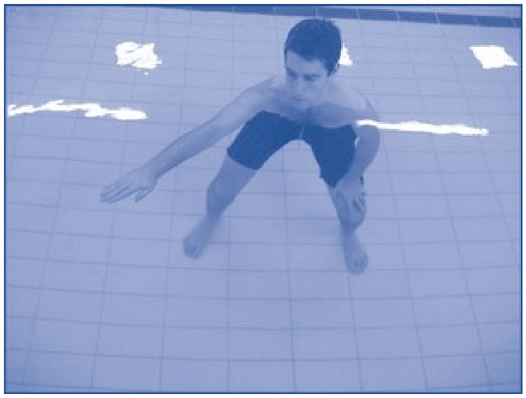


Figure 3.2 Laminar flow.

Turbulent flow

- Potential energy can be assumed to be fixed.
- If kinetic (speed) energy is increased, pressure energy must drop.
- A moving body leaves a wake of disturbed water, this water is swirling (the formation of eddy currents), and therefore moving faster than the still water in front of the body.
- The disturbed area is at a lower pressure and therefore creates a drag to movement (an object will always move from an area of high to an area of low pressure).
- The faster the body moves the greater the wake and the greater the drag effect.
- This is known as turbulence, and causes the greatest resistance to forward movement (Figure 3.3).

Figure 3.3 Turbulent flow.

Other factors influencing movement

- A streamlined shape produces less turbulence than a non-streamlined one.
- A bow wave positive pressure created in front of a moving object, impedes forward

movement.

- The 'stickiness' of a fluid in motion (water is 790 times 'thicker' than air), i.e. viscosity.
- Water is adhesive, i.e.: it will stick to an object rather than itself.
- There is a small amount of friction caused as water passes over a moving object.
- The cohesive forces exerted over the surface molecules of a fluid, manifesting itself as an elastic 'skin', i.e. surface tension.

Refraction

- This is the effect of light rays 'bending' as they pass into a material of a different density.
- Placing a straight rod partly into the water can easily show this, the rod will appear to kink at the water surface (Figure 3.4).
- The practical effects of this phenomenon to physiotherapists working in a pool environment are:
  - Measurements of angle must be taken with the limb completely out of the water
  - Submerged items will not be quite where you expect them to be.

Figure 3.4 Refraction.

Values and effects of hydrotherapy

- Table 3.1 lists the claimed benefits and effects of aquatic physiotherapy.
- As aquatic physiotherapy is a combination of the effects of immersion and exercise, consideration should also be given to the benefits of exercise alone.
- These have been described as:
  - Improved cardiovascular and respiratory function
  - Improved neuromuscular and physical performance
  - Improved posture and appearance
  - Relief of tension
  - Stimulation of mental activity

– Increased general feeling of health and well being
– Delaying the ageing process.

Table 3.1 Benefits of aquatic physiotherapy

Benefit	Reason
Relief of pain	Warmth of water Suppression of sns Stimulation of skin mechanoreceptors
Ease of movement	Support offered by buoyancy Reduced effect of gravity
Reduction of spasm	As for pain relief
Reduction of oedema	Hydrostatic pressure
Resistance to movement	Viscosity of water Negative drag of turbulence Weight/density of water Upward force of buoyancy
Enhanced relaxation	Reduced effect of gravity Support from buoyancy Reduction in pain Hypnotic effect of water
Enhanced well being	Ability vs disability Social interaction Enjoyment
Re-education of functional activities	Unencumbered Support from buoyancy Resistance to movement Metacentric effect
Enhanced cardiovascular fitness	Resistance to movement

Appropriate use of aquatic therapy

- Aquatic physiotherapy is often considered to be an expensive form of treatment both in terms of staff time and cost of facility.
- It is therefore important to ensure that patients are carefully selected, bearing in mind the following disadvantages unique to this form of treatment:
  - Acute fear of water
  - Treatment time limitations
  - Possible infection spread
  - Difficulties isolating some movements
  - Patient dependency on treatment
  - Contraindications to immersion.
- A common misconception is that aquatic physiotherapy is very expensive.Costing an aquatic physiotherapy service is quite straightforward.
- An average aquatic physiotherapy pool costs around £8.00 per usable hour (2006 costs).
- The following calculation provides an indication of the cost of one 3-hour aquatic physiotherapy session with a band 7 physiotherapist in the pool (2006 costings):

3 Hours Band 7	£67.92
3 Hours Band 2 (poolside assistant)	£25.44
3 Hours Pool time	£23.98
Total	£117.34
Average 11 patients treated during the session = cost of £10.66 per treatment	

- Comparable costs:

Band 7 physiotherapist carrying out 'normal' outpatient session (3 Hours)	
3 Hours Band 7	£67.92
0.5 Hours Band 2	£4.24
Total	£72.16
Average 6 patients treated during the session = cost of £12.02 per treatment (Maynard 2003).	

- Many of the contraindications to immersion are related to the physiological changes that occur, so a précis of these changes is covered in the following sections.

The physiology of immersion

- Immersion to the level of the sternum in humans is known as head out of water immersion (HOWI) and causes profound changes physiologically in the body. This chapter intends to look at the changes that occur in the following systems:

  - Haematological
  - Cardiovascular
  - Respiratory
  - Renal
  - Sympathetic nervous system.
- Knowledge of these changes is critical to ensure safe screening of patients prior to aquatic physiotherapy.

Haematological and cardiovascular systems

- On entry into water up to the sternal notch, the hydrostatic pressure gradient causes 700 ml of blood to be redirected towards the heart and cardiothoracic compartment from 'blood pooling in the limbs' (Hall et al 1990).
- This increases the central blood volume (CBV), and it is this that triggers many of the physiological changes.
- There is an increase in tissue reabsorption around the capillary networks of the lower limb, as the increased pressure narrows the capillaries and reduces the flow to the venules.
- Venous pressure is reduced, thus increasing the re-absorption force (i.e. the Starling force is tilted towards reabsorption back into the capillaries).
- 'Water immersion causes a haemodilution within the first 30 minutes' (Hall et al 1990).
- With the 700 ml increase in CBV and the haemodilution the following events occur 'immediately immersion is initiated' into thermoneutral water at 33.5–35.5°C (Hall et al 1990):
  - 30% increase in cardiac output (Hall et al 1990)
  - 50% increase in stroke volume (Weston et al 1987, as cited in Hall et al 1990)
  - Reduction in peripheral resistance (Hall et al 1990)
  - Blood pressure changes: 'systolic remains unchanged and diastolic drops by about 9 mmHg' (Hall 1996).
- It is important to note that these effects increase as the water temperature rises, so that at 39°C cardiac output increases to 121% (Weston et al 1987).
- Patients with resting angina or uncontrolled cardiac failure should not be taken into the pool due to the increased demand placed on the heart by immersion. Bucking (as cited in Hall 1996) 'recommended that water exercise be avoided for 6 weeks post cardiac event'.
- Also be aware of patients with hypotension, as immersion lowers their diastolic blood pressure still further and they may feel faint or light-headed.

Respiratory system

- Immersion alters pulmonary function via direct hydrostatic pressure effects on the thorax, cephalad displacement of the diaphragm, and the central hypervolaemia. The

following changes take place:
  - Expiratory reserve volume decreases (Craig and Dvorak 1975)
  - Vital capacity drops by 5–10% (Craig and Ware 1967 as cited in Hall 1990)
  - Increase in airway closure (Bondi et al 1976 as cited in Anstey and Roskell 2000)
  - Reduced lung compliance largely due to vascular engorgement stiffening the lungs (Dahlback and Lundgren 1972 as cited in Anstey and Roskell 2000)
  - 'Tidal volume is not affected' during immersion (Hall 1996).
- Therefore avoid taking patients with shortness of breath at rest (due to a respiratory pathology) into a pool.
- Exercising in water will also increase oxygen consumption compared to exercising on land. 'Oxygen consumption does not increase through warm water immersion per se' (Hall 1996), but when walking on a treadmill in water compared to on land oxygen consumption is 'significantly greater' (Gleim and Nicholas 1989 as cited in Hall et al 1990).
- Therefore oxygen dependency on land can be seen as a relative contraindication.

Renal system

- Immersion causes an increase in blood flow to the kidneys.
- Kidney metabolism is thus enhanced with greater excretion of sodium and greater urine output.
  - Six- to sevenfold increase in urine production (Hall et al 1990)
  - Sodium excretion increases by 200–300% (Hall et al 1990, p. 519)
  - Atrial natriuretic peptide production doubles (important factor in increased renal output and sodium excretion) (Hall et al 1990, p. 520)
  - Antidiuretic hormone and aldosterone production suppressed by stimulation of low-pressure stretch receptors in the atria and pulmonary arteries (Epstein 1976).
- Because of these effects renal failure can be seen as a precaution to immersion in the pool.
- It is essential that patients empty their bladders before getting into the pool, and also that they replenish their fluid loss at the end of the session.

Sympathetic nervous system

- The sympathetic and parasympathetic nervous systems are part of the autonomic nervous system.
- The sympathetic nervous system activates our fight or flight response and as such is responsible for actions such as increasing our heart rate.
- Thermoneutral HOWI lowers sympathetic activity.
  - It acts to 'reduce peripheral vascular resistance to compensate for increases in the stroke volume and cardiac output due to cephalad fluid shift; thus maintaining

hemodynamic homeostasis' (Mano 1998)
  - By suppressing sympathetic activity it can help reduce neurogenic pain including complex regional pain syndromes (CRPS)
  - Schencking et al (2009) found that hydrotherapy was effective at reducing CRPS pain.
- Aquatic therapy may also be responsible for reducing pain because the movement of the water over the skin stimulates mechanoreceptors which in turn closes the pain 'gate' mechanism (Melzack 1981).

Contraindications and precautions to aquatic physiotherapy (CSP 2006)

Absolute contraindications

- Acute vomiting or diarrhoea.
- Medical instability following an acute episode such as CVA, DVT, or status asthmaticus, if in doubt then check with the patient's consultant.
- Proven chlorine/bromine allergy.
- Resting angina.
- Shortness of breath at rest.
- Uncontrolled cardiac failure.
- Weight in excess of the evacuation equipment limit of the pool (refer to the local manual handling policy).

Relative contraindications

- If the following are present aquatic physiotherapy may be considered after a risk-benefit analysis:
  - Acute systemic illness/pyrexia
  - Irradiated skin due to radiotherapy. Be aware that irradiated skin 'will always be more sensitive to heat' and 'wounds will heal more slowly' (Brooks 1998). Also be aware that chlorine can cause a skin irritation
  - Known aneurysm
  - Open infected wounds will need to be managed according to local infection control policies
  - Poorly controlled epilepsy
  - Unstable diabetes and the effects of exercising in the water may result in a patient having an episode of symptoms relating to a drop in their blood sugar. They should be monitored closely for any signs of this occurring and a snack should be available

on the pool side
– Thyroid deficiency: 'metabolism of thyroid hormone may be associated with deficient thermoregulation' (Beard et al 1990)
– Patients with neutropenia should not be taken into an aquatic therapy pool when their white blood cell count is very low
– Oxygen dependency.

Precautions

- Fear of water.
- Behavioural problems.
- Incontinence of urine – patient can be catheterised during session.
- Epilepsy. Clients who suffer from epilepsy can attend aquatic physiotherapy but the epilepsy needs to be controlled by medication such as rectal diazepam which the pool staff need to be trained in administering.
- Haemophilia (check factor VIII or IX) – may need to take clotting factors prior to exercise. Swimming is actually very beneficial for clients with haemophilia (Von Mackensen et al 2009).
- Hypotension.
- Renal failure.
- Widespread MRSA – only as a precaution on poolside as chlorine kills MRSA in the water (Tolba et al 2008).
- Poor skin integrity. e.g. open/surgical wounds.
- Pregnancy if water temperature exceeds 35°C (CSP 2009).
- Contact lenses and conjunctivitis.
- Hearing aids/grommets.
- Impaired vision/sensation/hearing.
- Invasive tubes in situ – PEG sites do not need to be covered.
- Risk of aspiration.
- Incontinence of faeces (less than 2 hourly) – bowel management programme should be established.
- Low calorie intake – 'ensure that aquatic physiotherapy is not used as a means to reduce weight' by drawing up a contract with the client (CSP 2006).
- Prone to blackouts.
- Sickle cell anaemia – swimming in cold water may trigger a painful crisis in some children. 'Cold exposure increases blood viscosity' and can lead to 'even further sickling' (Resar and Oski 1991).
- Inefficient thermoregulation. Be aware that clients can get very cold whilst they are leaving the pool and are still wet. Conversely an aquatic physiotherapy pool room can become very humid in the summer.
- Tracheostomy, current guidelines are being developed. One member of staff is required to look after the tracheostomy and a portable suction machine should be present on the

poolside. An appropriately experienced physiotherapist should be present.

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Chapter 3

E-materials

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Stephanie Taylor, Aquatic Physiotherapist, Nuffield Orthopaedic Centre, NHS Trust.
Mr Alan Hazlett

Author profiles

Dr Anne Jackson PhD MSc BA(Hons) MCSP

Anne Jackson has been a specialist in aquatic physiotherapy for much of her career, working clinically in the South of England. Her PhD thesis focused on outcomes and patient experience of aquatic physiotherapy. She was editor of Aqualines, the Journal of the Aquatic Therapy Association of Chartered Physiotherapists, from 2003 – 2010 and has been a frequent author of a range of papers in this journal. She has been involved with establishing the international group Aquatic Physical Therapy International. Anne currently works for the Chartered Society of Physiotherapy.

Cathy Stringer BSc(Hons) BEd MCSP

Cathy qualified as a physiotherapist in 2004 after a career change and has been employed by Good Hope Hospital, Heart of England Foundation Trust ever since. She completed my junior rotations and chose to specialise in musculoskeletal out-patients, where she divides her time between working in the hydrotherapy pool and working in the out-patient

department treating patients with chronic pain problems. Cathy has been instrumental in developing the pool services to include classes for hip and knee arthroplasties, Bad Ragaz for shoulder rehabilitation and ante-natal classes and has plans for further initiatives to be developed in the future.

Alison Skinner

Alison Skinner has worked in physiotherapy education at the Middlesex Hospital School of Physiotherapy and later at University College London specialising in Aquatic Therapy. She has taught Aquatic Therapy both in the UK and internationally for many years. Her qualifications include certificates in hydrotherapy following a 6 month course from the Chartered Society of Physiotherapy and a senior lecturer's certificate from the International Halliwick Association. She has written articles for a variety of publications and co-edited Duffields Exercise in Water. Currently she is Treasurer of the Aquatic Therapy Association of Chartered Physiotherapists.

Susie Grady MSc BSc(Hons) MCSP

I work as the Aquatic Therapy Team leader at The Gardens and Jacob Neuro-rehabilitation centres in Hertfordshire, UK. These centres are part of the Ramsey Healthcare group. I am responsible for delivering the Aquatic Therapy service to our clients who all have

neurological conditions.

I have served on the ATACP committee for 6 years and have held the position of Research Officer and CPD Co-ordinator.

I have also gained a Masters Qualification in Veterinary Physiotherapy, and work as a self-employed Veterinary physiotherapist with both horses and dogs. I am a category A member of ACPAT and my research project investigated the use of canine hydrotherapy in the UK and abroad.

www.4legsphysio.co.uk.

Ankie Postma GradDipPhys

Ankie Postma is a physiotherapist working part time at Basildon Hospital, Essex, UK. She has responsibility for the Aquatic Physiotherapy service in her district, but her caseload includes amputees and patients with ankylosing spondylitis as well. She undertook the 'Bath Hydrotherapy Course' in 1994, after which she joined the ATACP committee, where she has been the minute secretary for many years. Apart from her NHS work, she is involved in the local NASS group and 'WADERS' (Water Assisted Disability Exercise and Rehabilitation Scheme), an exercise group for people with mobility problems, in local leisure pools.

Mike Maynard GradDipPhys HT

Mike Maynard qualified from Bath School of Physiotherapy in 1980, and this training kindled his interest in aquatic physiotherapy. He joined the Royal Air Force on qualifying, and over 20 years served at various military hospitals both home and abroad. He is now Site Lead Physiotherapist at Pilgrim Hospital, in Boston, UK and is Clinical Lead for Aquatic Physiotherapy for United Lincolnshire Hospitals.

He has carried out aquatic physiotherapy treatments in situations as diverse as a 6-foot-square pool in Germany, to a full-size outdoor swimming pool in Cyprus and served 2 periods at the Medical Rehabilitation Unit Headley Court in Surrey. During the first period he was responsible for all the individual (rather than class-based) patients, and the second period involved responsibility for a complete pool rebuild plus setting policy for the running and use of the aquatic physiotherapy facility.

He successfully passed the Bath Hydrotherapy Course in 1996, and commenced national and international teaching on a variety of courses in 1998. He is on the committee of the Aquatic Therapy Association of Chartered Physiotherapists (ATACP); and took over the chair in April 2000.

He has presented at many aquatic physiotherapy study days and at the PCT conference at the NEC Birmingham in 2008. He also leads the Education subgroup of the ATACP. He was awarded a Chartered Society of Physiotherapy Distinguished Service Award for his services in aquatic physiotherapy in 2009.

Case Study 1: Post traumatic back pain

Background

- The patient fell from a ladder and sustained a crush fracture of L3 with no associated spinal cord injury.
- He was immobilised for 6 weeks in a rigid brace and was taken out of the support for exercise.
- He demonstrated fear avoidance behaviour and was reluctant to move at all.

- He agreed to aquatic physiotherapy after it was explained to him what this would entail.
- There were no contraindications to hydrotherapy, however excessive flexion was to be avoided.

Treatment outline

- Early sessions
  - A basic home regime of exercises was commenced, including pelvis setting and control.
  - The patient commenced aquatic therapy standing in water to a depth of T11 performing slow head movements of flexion and extension.
  - He was immersed to this depth in order to challenge his balance and core stability.
  - Therapist turbulence (created by the therapist with their hands) was applied at waist level to further challenge core stability.
  - The patient progressed to standing at the rail and performing alternate hip flexion/extension to encourage spinal movement, and trunk rotations (free movement).
  - Anxiety was reduced sufficiently to enable the patient to be put into supine float lying.
  - Rhythmical stabilisations for trunk flexors, extensors and rotators were added to transversus abdominis setting and were performed by the physiotherapist applying pressure at the shoulders and pelvis while the patient resisted the pressure.
  - As the patient improved in mobility and strength, work at the rail was introduced to increase trunk extension and flexion (the patient held the rail with elbows extended and walked their feet back to stretch the spine into extension, this was followed by walking the feet forwards to increase flexion).
  - In supine lying, buoyancy counterbalanced side flexion movements were added, along with transversal rotations into flexion and extension. For this exercise the patient held a float in each hand and flexed and extended their neck rolling it backwards and forwards.
  - The exercise was started with small pendular movements and gradually progressed to a fuller swing.
  - Longitudinal rotations, with the patient lying supine and turning the head from side to side were added to assist trunk rotation.
- Later sessions
  - Posterior to anterior mobilisations were applied to the lumbar spine with the patient supported in supine lying.
  - Supine lying was used to induce buoyancy resisted trunk flexion and extension exercises.
  - Aerobic conditioning work was commenced using exercises such as "spotty dogs" (alternate leg and arm movements in the water), full transversal and Saggital (side to side) rotations holding dumbbells, pushing and pulling, lunges with a kickboard

and rotations using the elbows in the water to create resistance to movement "Helicopters".

- Outcomes
  - Final rehabilitation was progressed to exercises on land in a gym.
  - At this point the patient had begun to return to work on light duties which were progressed gradually back to his normal levels of workload.

Case Study 2: Spinal cord injury

Background

- "Dave" is in his 50's and had a car crash 6 years ago which left him with a T10 paraplegia.
- He was referred to physiotherapy to promote upper body strength, as he was having difficulty transferring to and from his wheelchair.
- Following assessment the physiotherapist considered that the pool would be the best environment to manage his disabilities and produce the desired improvements in his upper body strength.

Treatment outline

- Early sessions
  - Dave had always been nervous of water and was a non swimmer.
  - Initially it was important for Dave to gain confidence in being immersed in the water.
  - This was done by demonstrating how water is a supportive medium.
  - Once he had gained some confidence techniques such as pushing down into the water against floats, moving paddles through the water, and pushing against the physiotherapist (commonly known as Reversal techniques) to move himself through the water were used to strengthen the arms and upper body.
  - Dave was supported by floats attached to his body to provide additional reassurance when exercising.
  - He reported that his ability to transfer from his chair had improved and it felt easier.
  - He continued to find exercise on land difficult, especially any exercise to improve his general fitness.
- Later sessions
  - It was suggested that Dave consider learning to swim as a means of exercising in a way that he could manage. Although reluctant at first, he agreed to try this.
  - To ensure that Dave could feel safe and be independent in water it was necessary to ensure that he could always get himself into a safe breathing position.

- This was done by working on his ability to get from front to back and visa versa, both side to side and front to back (Transversal and Longitudinal Rotations).
  - Because of his lack of confidence in water this took a longer time than expected.
  - He eventually became proficient enough to be deemed safe by the physiotherapist and importantly felt safe himself.
  - Dave was taught a swimming stroke that is recommended for his type of disability, which is similar to double over arm backstroke.
  - He managed this well, but again it took a few weeks before he felt truly confident that he could maintain his balance in the water whilst swimming.
- Outcomes
  - Dave now goes to his local pool on a regular basis, and on his last attendance he stated that the aquatic physiotherapy had opened up a whole new life for him, as in the water he could move and exercise independently, something that he found almost impossible on land.

Case Study 3: Total knee replacement class

Background

- A 69-year-old male was referred to hydrotherapy following a right total knee replacement.
- The patient lived alone in a house with one flight of stairs.
- He struggled to ascend and descend the stairs reciprocally.
- He had hypertension, which was controlled by medication.
- He was retired, but carried out a small part time job to keep active. He also enjoyed cycling, but was unable to cycle due to limited movement and pain in his right knee.

Assessment

- The patient visited outpatient physiotherapy for his initial assessment.
- At this time he was complaining of pain in his right thigh that he described as pressure.
- He also had pain tracking down his right tibia, tightness in his right calf and decreased movement in his right knee.
- Right knee flexion measured 80°, extension was 15° from full extension. Left knee had 0°–130° flexion.
- His strength was grade IV through available range of active knee flexion / extension.
- He was able to sustain an isometric quadriceps contraction and straight leg raise without any lag.
- The right knee was painful to palpation over the patella tendon and on the lateral border of the patella and knee joint line.

- He complained of 7/10 pain (VAS scale) when weight bearing on his right leg.
- There were no direct contraindications and no relative contraindications to hydrotherapy. His hypertension was controlled with medication, which was noted as a precaution for entering a hydrotherapy programme.

Problem List

- Pain when weight bearing through affected leg (right leg).
- Loss of range of movement –15° extension to 80° flexion.
- Decreased balance less than 30 seconds.
- Decreased lower limb strength.
- Decreased exercise tolerance.
- Decreased confidence using new total knee replacement.

Goals

- Decrease pain to 2/10 VAS.
- Increase range of movement (–5° to 100° active knee flexion).
- Maintain / increase muscle strength to grade IV–V (Oxford scale).
- Increase exercise tolerance.
- Increase confidence in using new total knee replacement.

Treatment

- The patient was allocated a place into a hydrotherapy total knee class programme.
- The programme ran for six weeks and consisted of range of movement exercises, lower limb and core strengthening, gait re-education, balance and proprioception exercises.
- Each session ran for 30 minutes and started with a warm up of marching at the wall or up and down the pool.
- Treatment consisted of buoyancy assisted exercises using both the water and buoyancy aids to regain movement; lower limb and core strength work using turbulence, buoyancy resistance and drag.
- The patient also received exercises for improving balance standing on both legs progressing to standing on one leg, with turbulence being used to challenge balance and gait.

Outcomes

- After completing the total knee replacement programme the patient reported a decrease in pain when weight bearing (0/10 to 2/10 VAS).

- He had achieved 0°–108° active knee flexion.
- Balance standing on one leg had increased to more than thirty seconds.
- His strength remained at grade IV (Oxford scale).
- The patient reported that he had increased confidence in his total knee replacement and felt able to return to his part time job.
- He reported that he found the group setting really helpful as all the patients in the group had total knee replacements and they were able to discuss their experiences of surgery and recovery and also encourage each other during the programme.
- He felt reassured that he was not the person experiencing pain and discomfort and that his recovery of movement had progressed at an expected rate.
- He had not attempted to ride his bike due to bad winter weather, but intended to try cycling once better weather returned.

Chapter 3 Aquatic physiotherapy multiple choice questions

1. Which is not a physical property of water?
   a). Buoyancy
   b). Turbulence
   c). Cohesion
   d). Metacentre
2. Which of the following statements is true? The apparent weight relief gained from buoyancy is:
   a). Equal to the weight of the water displaced
   b). Less than the weight of the water displaced
   c). More than the weight of the water displaced
   d). Dependent on the weight of the object.
3. A person with a high proportion of adipose tissue will:
   a). Float less easily?
   b). Float more easily?
   c). Be more stable in water?
   d). Need a neck collar at all times?
4. Which is not a factor for stability in water?
   a). Distribution of densities
   b). Weight of the object
   c). Shape of the object in the water
   d). Depth of the water
5. Does slow movement in the water require:
   a). Low energy input?
   b). High energy input?
   c). The speed of movement does not make a difference?
   d). Flotation devices?
6. Which of the following is correct?
   a). Movement runs parallel to pressure differences in water

b). Movement occurs from an area of high to an area of low pressure
c). Movement occurs from an area of low pressure to an area of high pressure
d). Movement varies according to surface tension

7. Which of the following is correct?
a). An object with a relative density of less than 1.000 will sink
b). An object with a relative density of less than 1.000 will roll in water
c). An object with a relative density of less than 1.000 will float
d). An object with a relative density of more than 1.000 will float

8. How many ml of blood is redirected to the central thoracic space on immersion to the sternal notch?
a). 400 ml
b). 700 ml
c). 100 ml
d). 1000 ml

9. What is the range of water temperatures regarded to be within the thermoneutral range?
a). 35–36°C
b). 33.5–35.5°C
c). 30–33°C
d). 36–38°C

10. Which of the following is not a physiological change in the heart when immersed to the sternal notch in thermoneutral water?
a). Cardiac output rises by 30%
b). Stroke volume rises by 50%
c). Diastolic pressure drops
d). Heart rate rises by 30%

11. Which of the following is a physiological change in the respiratory system during immersion to the sternal notch?
a). Vital capacity drops by 5–10%
b). Functional residual capacity drops by 30–60%
c). Breathing effort increases by 58–60%
d). All of the above

12. Which of the following is a physiological change in the renal system during immersion to the sternal notch?
a). Urine production falls by 420% by the third hour
b). Urine production rises by 6 to 7 fold
c). Sodium excretion fall by 2–3 fold
d). Anti-Diuretic Hormone production increases

13. Which of the following is a physiological change in the sympathetic nervous system during immersion to the sternal notch?
a). Noradrenalin production falls
b). Sympathetic activity increases peripheral circulation resitance
c). Suppression of sympathetic activity

d). There is no change

14. Which of the following is not an absolute contraindication to aquatic physiotherapy?
    a). Acute diarrhoea and vomiting
    b). Proven chlorine allergy
    c). Open infected wounds
    d). Paroxysmal nocturnal dyspnoea
15. Which of the following is not a relative contraindication to aquatic physiotherapy?
    a). Irradiated skin following recent radiotherapy
    b). Poorly controlled epilepsy
    c). Weight of the patient exceeds the weight limit of the evacuation equipment
    d). Unstable diabetes
16. Which of the following is a precaution for aquatic physiotherapy?
    a). Haemophilia
    b). Hypertension
    c). Veruccas
    d). Poor circulation
17. Eccentric muscle work in water is obtained by:
    a). Letting a float up to the surface slowly
    b). Pushing a float down away from the surface
    c). Sweeping a limb quickly through the water
    d). Holding a float still in the water
18. A movement can be improved in range by:
    a). Moving a limb briskly through the water
    b). A therapist creating turbulence around a limb
    c). Moving a float down away from the surface
    d). Letting a float move up towards the surface
19. Which of the following is not a technique that will allow muscle strengthening?
    a). Moving a limb briskly through the water
    b). Pushing a float down away from the surface
    c). Holding against the effect of drag
    d). Letting a limb move with drag
20. Standing still in deep water with the head tilted back
    a). Mobilises the thoracic spine
    b). Strengthens the trunk flexors
    c). Strengthens the trunk extensors
    d). Increases the workload on the shoulder retractors

Aquatic physiotherapy multiple choice answers

1. c)
2. a)
3. b)
4. b)

5. a)
6. b)
7. c)
8. b)
9. b)
10. d)
11. d)
12. b)
13. c)
14. c)
15. c)
16. a)
17. a)
18. d)
19. d)
20. b)

  – Painful and heals in 10–14 days
  – Appears red with capillary return
  – Forms minimal scarring (Settle 1996).
- Deep dermal – Tissue destruction involves the epidermis and superficial layers of the dermis.
  – Appears red without capillary return and no blisters.
  – Healing is slow and skin is thin and forms dense scarring (Figure 4.2).

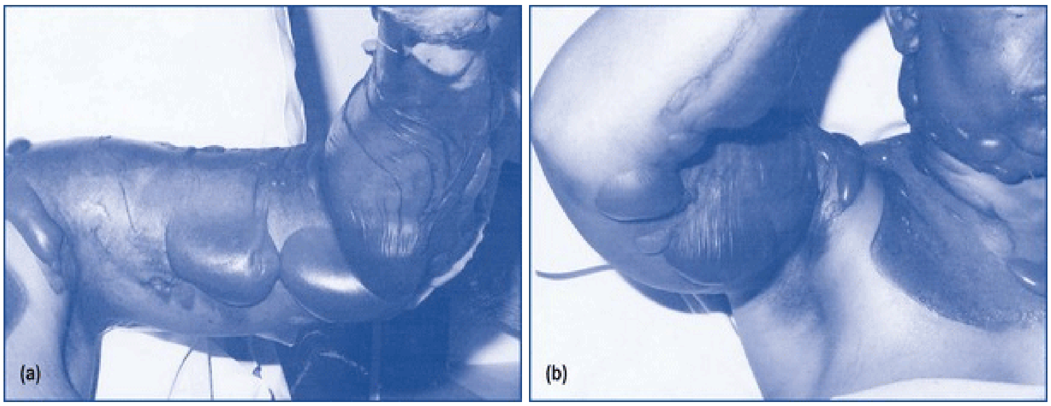

Figure 4.2 Partial-thickness dermal burns to both upper limbs and neck with extensive blister formation.

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Full-thickness burn

- These burns are not painful.
- They can involve muscle, tendon and bone.
- Skin loss means that there are no accessory skin structures such as hair follicles to epithelialise.
- Healing will therefore only occur by the epithelium migrating from the edge of the burn wound.
- It is only possible for a very small burn to heal in this way.
- Appears white, waxy looking, or charred black (Figure 4.3).
- Requires management by excision of necrotic tissue and skin grafting (Settle 1996).

Figure 4.3 Full-thickness burn of the abdominal region after a fire accident.

Causes of burns

- Burns can be caused by excessive heat or cold, by chemicals, ultraviolet light or radiation.
- The most common causes of burns requiring hospital treatment are:
  - Scalds from hot fluids or steam are common in the under fives and the elderly.
  - Explosions, flash flame or steam, bonfires, fireworks, barbeques and the use of flammable liquids such as petrol. Flash burns tend to be partial-thickness burns, but can be deeper if the patient's clothes ignite.
  - Flame burns occur when the patient's clothes, hair or skin catch light. The effect of damage from house or car fires is exacerbated by the inhalation of toxic gases from burning household furniture, leading to severe inhalation injuries as well as burns.
  - Contact burns from contact with molten metal or plastic are common in industry. An unconscious patient may sustain burns from contact with a cooker or a hot radiator.
  - Electrical burns due to electrical current from plugs, sockets and wiring. Deep structures can be involved at the current entry and exit sites on the body. The patient's cardiac status requires close monitoring.
- Non-thermal burns, include:
  - Chemical damage, acid or alkali substances can cause deep burns, a commonly seen burn is that from contact with cement powder.
  - Friction injuries include friction burn from the road surface, e.g. cyclists and motorcyclists.

History

- Details of how the injury occurred, duration of contact, protection offered by clothing and first aid given can all provide an indication of the type and depth of a burn.

- As burns occur in traumatic circumstances it is important to ensure that other associated traumatic injuries have been eliminated, e.g. fractures, nerve injuries, spinal and head injuries.

Burns charts

- These are used to record the distribution of the burns and are normally completed by an experienced burns doctor.
- Lund and Browder charts (Figure 4.4) are used to record total body surface area (TBSA) and the depth of the burns, which are documented as partial-thickness (PTB) or full-thickness burns (FTB) (Herndon 2007).
- The larger the total burn surface area, the worse the prognosis for the patient.
- It is important to calculate accurate TBSA, as this will guide the amount of fluid replacement that is required to stabilise the patient.
- The 'rule of nines' is another method of gauging the TBSA. This divides the body surface into 11 areas, each making up 9% of the total, apart from the perineum which is allocated 1% (Porter 2008).
- There are separate charts for paediatrics. This takes into account the ratio of different body regions to the TBSA, which changes with age (Table 4.1).

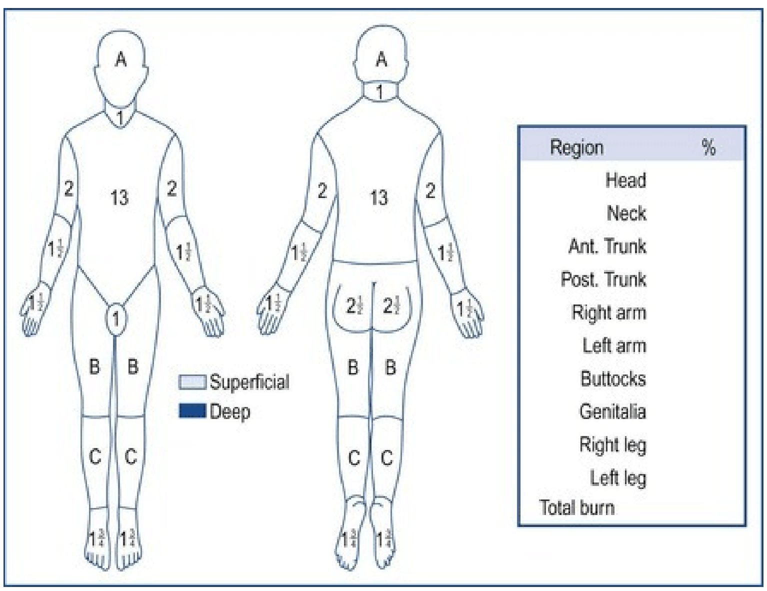

Figure 4.4 Lund Browder chart.

Table 4.1 Relative percentage of areas affected by growth

Age (years)	0–1	1–4	5–9	10–14	15	Adult
A ½ of head	9 ½	8 ½	6 ½	5 ½	4 ½	3 ½
B ½ of one thigh	2 ¾	3 ¼	4	4 ¼	4 ½	4 ¾
C ½ of one leg	2 ½	2 ½	2 ¾	3	3 ¼	3

Pathological changes

Burns shock

- The unique pathological changes include burns shock. This is the inability of the circulatory system to provide oxygen and nutrients and to remove metabolites (Settle 1986).
- The risk of burns shock is due to a decrease in circulatory plasma volume or hypovolaemia caused by plasma leaking from damaged capillaries.
- There is loss of proteins and electrolytes from the blood and there is an increase in blood viscosity.
- The body compensates by shutting down blood supply to the skin, abdominal organs and the kidneys.
- The massive fluid loss and risk of septicaemia gives rise to major cardiovascular instability. If left untreated the fall in cardiac blood pressure can lead to vital organ failure.
- The severity of shock is related to the surface area of skin damage.
- The BP, CVP, haematocrit, urine output and heart rate must be monitored during the acute burn period (Leveridge 1991). Volume of fluid transfusion is adjusted as required to maintain balance.
- The problems of sepsis, massive fluid loss, cardiovascular instability and high airway pressures mean that in order to treat the lung injury, physiotherapists have to repeatedly re-assess the consequences of their treatment in the context of the multi system problems (Keilty 1993).

The symptoms of shock include

- Sweating, cold and pale skin
- Tachycardia
- Hypotension
- Rapid respiratory rate.

Assessment for fluid resuscitation

- Fluid resuscitation will need to be commenced if the TBSA is; >10% in children and >15%

in adults (Settle 1996).

- The amount of fluid will need to be calculated, so that it will restore and maintain adequate perfusion of blood to all body tissues. Thirty-six-hour fluid resuscitation is subdivided into numerous periods with the patient being regularly reassessed at the end of each period. Developing signs of shock suggest inadequate fluid management.

Initial findings

- Burns with a TBSA of more than 10% in children and 15% in adults, those with suspected inhalation injury or burns on specific areas of the body, e.g. hands and feet, are generally treated in a specialised burns unit or centre (Porter 2008).
- The specialist burns unit approach leads to improved patient care and provides support for each member of the team in working situations that can be stressful.
- Therapy intervention begins within the first 24–48 hours following admission; therapists have an important role throughout all stages of recovery, to give encouragement, instil confidence and gain co-operation of the patient to enable the patient to be managed effectively.
- Assessment of burns requires good organisational skills, due to the complexity of these injuries.
- The main problems that are likely to be found include:
  - Respiratory problems from inhalation burns
  - Swelling
  - Pain
  - Decreased range of movement of involved joints
  - Soft tissue contracture
  - Scarring
  - Loss of function.
- Following admission wounds will be cleaned, debrided and dressed and the process of fluid resuscitation and stabilisation will begin.
- Large burns are life-threatening due to fluid loss, excessive cooling, poorly maintained body temperature and risk of infection.
- Surgeons are responsible for overall evaluation of the burn and patient resuscitation at this stage.
- The therapist will begin their assessment of the patient according to the TBSA of the burn, pre-existing medical conditions and the patient's respiratory status. It is important to confirm details of the injury.
- Information may be obtained from medical notes or charts, other members of the burns team, e.g. doctors, the patient and their family.
- The patient will be nursed in a side room, possibly on an intensive therapy unit (ITU).
- The room temperature is kept higher than normal, at 28°C or more to regulate the patient's subnormal temperature due to burns shock and the loss of the thermoregulation function of the skin, in order to counteract the shutting down of the

peripheral circulation.

- There will be strong odours due to plasma leaking from wounds, necrotic tissue and any infections, e.g. Pseudomonas.
- The patient may be ventilated, following an inhalation injury, or if there is excessive head or neck swelling.
- The patient may be sedated or alert and anxious.
- They may have dressed burns and/or exposed burns with associated erythema, blisters, and yellow/white skin, blackened tissues. Dressings may be bulky, to absorb the oozing from wounds.
- Hands may be in flammazine bags, permitting exercise without the restriction of dressings.
- Swelling may be pronounced, altering facial appearance and possibly reducing vision (Figure 4.5).

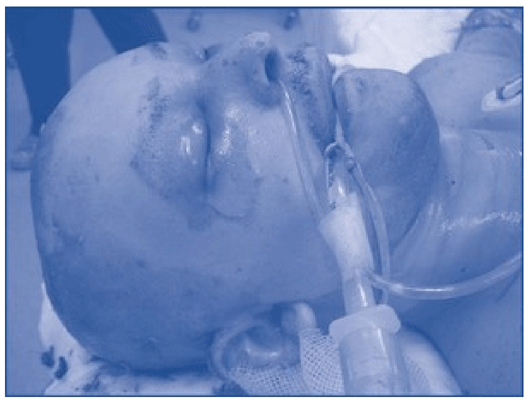

Figure 4.5 Acute burn showing facial oedema.

Inhalation injury

- Smoke inhalation is the primary cause of fire-related deaths, increasing mortality by 20% (Shirani et al 1987).
- Inhalation injuries can be due to thermal damage to the upper respiratory tract, or by chemical damage from the inhalation of toxic particles or fumes, such as cyanide.
- The airway responds by producing mucosal oedema, erythema and ulceration.
- The resultant damage affects the body's ability to maintain the ventilation/perfusion balance.
- Secondary damage can occur in response to inflammation, which leads to increased vascular permeability, in turn leading to exacerbation of pulmonary oedema, increasing respiratory resistance and reducing lung compliance.
- Patients with inhalation burns are at risk of developing pneumonia, which can increase the mortality rate by up to 40% (Shirani et al 1987).
- A patient having three of the following clinical factors will in all probability have a

significant inhalation injury. These may be difficult to diagnose on first admission. They should be recorded in physiotherapy records.

- Factors indicating an inhalation injury:
  - Fire in closed/confined space
  - Facial, neck or chest burns and or oedema
  - Carbonaceous sputum/bronchial casts
  - Perioral burns
  - Altered consciousness or confusion
  - Respiratory distress
  - Hoarse/loss of voice/stridor
  - The presence of raised carboxyhaemoglobin in the blood
  - Bronchoscopy results showing oedema.
- A patient demonstrating these signs may require intubation and ventilation.
- A respiratory assessment is conducted to determine the treatment needs of the patient, focussing on the patient's ability to maintain a clear airway and should include: respiratory rate, arterial blood gas tensions, degree of cyanosis, chest auscultation and chest radiograph.
- Assessment should include subjective and objective information gathering which is completed and documented within 24 hours of the patient's admission (BASW 2005).
- Pathological changes may not be evident with X-ray in the early stages post burn injury; they may take 24–48 hours to develop.
- Chest problems will often be worsened by multiple surgical procedures required during the acute stage.
- Problems resulting from inhalation injury:
  - Reduced chest expansion if burns are over the chest wall
  - Sputum retention
  - Airway obstruction
  - Pneumonia
  - Adult respiratory distress syndrome (ARDS).

Musculoskeletal changes

- The physiotherapist will assess the location of burns, if a burn crosses a joint there is a risk of scar formation, which will lead to contracture.
- All joint ranges will need to be assessed, with the aim of maintaining joint range and soft tissue length to prevent contractures.
- Joint range should be assessed actively if possible and passively, with the degrees of movement being recorded, using goniometry.
- Assessment of muscle power, strength and function should include, where possible, mobility and gait.
- Functional assessment should include the ability to perform activities of daily living (ADL) at home, work roles and any hobbies.

- Assessment may require a dressing to be taken down, if they are restricting movement, limitations may also be due to burnt tissues or the patient's tolerance of pain.
- Pain levels must be assessed and recorded, e.g. using a visual analogue scale (VAS).
- At all stages the therapist should ensure that the patient has adequate pain control and must assess with this in mind.
- Continual reassessment of ROM is required as healing occurs.
- If initial assessment is delayed, it becomes more difficult to assess the patient's potential due to the increased prevalence of oedema at 24–48 hours post burn.
- Oedema is the accumulation of protein-rich fluid or exudate leaking out of injured capillaries, which results from the movement of fluid from intravascular sources to the interstitium through open wounds. This oedema results in a limitation in ROM especially in the distal extremities. If allowed to remain it can form fibrotic thickenings in the tissue, resulting in stiffness, contractures, pain and dysfunction.
- Assessment will need to establish the need for splintage, to position joints and maintain joint range especially in the wrists, hand and elbows.
- Assessment of the burnt hand posture is needed to prevent the development of deformities, e.g. boutonniere deformity of the PIP joints. The burnt hand will adopt a dysfunctional posture if it is not properly assessed and managed.
- Following the application of grafts, joints may need to be immobilised to allow healing. The therapist should commence assessment when grafts are stable.

Assessment of scar formation

- The normal healing process involves contracture and scarring. As scarring forms the following problems may develop:
  - Reduced ROM due to contraction or adherence to other tissues
  - Hard immobile scarring, with possibly raised, hypertrophic areas
  - Tight scarring which is uncomfortable, itchy or hypersensitive.

Psychological status of the patient

- It is important to obtain a good social history and impression of a patient's psychological status.
- Knowledge of pre-injury hobbies, employment and family support systems enables the therapist to set individual goals and treatment plans to maximise a patient's response and compliance.

Stages of assessment

- In the early stages assessments are carried out in the hospital setting.
- As the patient recovers they may be continued in the outpatient department or in the

patient's home environment.

- The later stages of assessment may include consideration of independent function in the home or at work and any adaptations that need to be made.

Plastic surgery

Background

- Derived from the Greek *plastikos* which means to mould or to form, defined as:

  ... repairing people and restoring function. It is performed to repair and reshape bodily structures affected by birth defects, developmental abnormalities, trauma/injuries, infections, tumours and disease ([BAPRAS, 2010](#)).

- Plastic surgery is not just related to cosmetic procedures, e.g. 'tummy tucks' or 'nose jobs'. These procedures comprise about 5% of the total of work done on the NHS, with the majority being reconstructive plastic surgery.
- Plastic surgery may be encountered in many clinical areas:
  - Head and neck surgery – ENT
  - Craniofacial surgery
  - Cleft lip and palate surgery
  - Breast surgery
  - Trauma
  - Oncology
  - Orthopaedics
  - Hand and upper limb surgery, including brachial plexus and nerve reconstruction.
- The conditions and types of surgery covered in this book are those which would be seen on a typical plastics ward/specialist surgery ward.

Tendon and nerve injuries

- Patients with tendon injuries tend to be seen by therapists following exploration and reconstructive surgery of any injured structures.
- Although protocols vary depending on the specific unit, patients would tend to come to therapy between 1 and 5 days post surgery. Most units follow an early active movement regime.

Assessment

Operation and medical notes

- These will provide information about the social history, past medical history (PMH), medication history (DH) and importantly how the injury occurred.
- These will tell you what structures were repaired, and how they were repaired.
- They will inform you about the state of the structures and whether the repair was deemed to be a strong repair, or if the surgeon requires the repair to be treated with care.
- There may be information relating to any associated injuries. e.g. fractures, or skin loss.

Talk to the surgeon

- They may be able to provide more information about the patient and the surgery than was recorded on the operation note.

Revise anatomical knowledge

- It helps to confirm how to test the tendons involved. Have a good textbook available for reference e.g. Muscles, Testing and Function (Kendall and McCreary 1983).
- Know neural anatomy and areas supplied to test nerve function following injury and repair.

In the assessment area

- The patient may have a bulky bandage and plaster of paris (POP) slab in situ. Flexor tendon repairs will have a POP slab over the dorsum of the arm and fingers, called a 'flexor hood' or 'dorsal slab'.
- Extensor tendon repairs will have a slab on the volar aspect.
- Nerve injuries should be in a volar slab or the arm supported to restrict movement at the repair site.
- In each case, the hand should be in a position of safe immobilisation (POSI) to maintain length in the ligaments.
- The inter phalangeal joints (IPJ) are maintained in neutral extension, the metacarpophalangeal joints (MCPJ) in 50–90° flexion and the thumb in mid-position.
- If the patient does not have a bulky dressing in situ and it states on the operation note that they were put in one after surgery, it is imperative that the tendons are checked to ensure that they are intact.
- Assessment is carried out following a SOAP format (Table 4.2).

Table 4.2 Subjective Objective Assessment Plan (SOAP) questions and reasoning

Questions	Why you want to know
How did they injure/damage the area?	Were they at work? Will this create problems for returning to work? Is there a claim against work? Was it at home – social difficulties?

Time between injury and repair?	Ideally a tendon should be repaired within 72 hours. Longer time frames can affect the outcome (Langley and Hobby 2010)
Pain presentation: Pain levels	To ensure compliance and good tendon healing, patients need to be doing early exercises. This becomes more difficult if their pain is not adequately controlled
Pain descriptions	Nerve pain – burning, electric shocks, deep aching, fizzing Tissue pain – ache, sore, itchy
Paraesthesia or anaesthesia	Pins and needles or numbness? May be due to a nerve that was injured and repaired, or is there paraesthesia for another reason?
Is there anyone at home with them?	If a tendon injury, they will be unable to use the injured hand for up to 6 weeks (12 weeks before it is fully strong). Are they likely to take off the splint as soon as they get home to make things easier for themselves?
Do they smoke?	Nicotine affects the ability of tendons to heal themselves
Occupation?	Are they self-employed? Will they have financial difficulties which might mean they go back to work earlier than recommended? Do they get sick pay?
Hand dominance?	Which is the injured hand? They may be more compliant if the injured hand is not the dominant hand
Past medical history	Have they injured their limb before? What was damaged? This will give an indication of pre-injury function Do they have diabetes? This can affect healing time Any infections which could affect healing?
Drug history: medication they are taking	Useful to know if they are on antibiotics post injury – are they taking them? Other analgesia or medication for co-morbidities

Once the subjective assessment is completed

- Explain what you are about to do
  - The last time the patient saw their limb, e.g. hand, it may have been in a traumatic situation. Tell them that you are going to remove their bandage to look at their wounds. They don't have to look, however encourage them to do so, as what they are thinking or imagining is always worse than how their hand actually is.
  - Check whether they have eaten before they came to the appointment, and that they don't usually faint when they see wounds. If any doubt exists lie the patient down before removing the dressing.
- Be prepared, it is not good for the patient to hear a sharp intake of breath or a surprised comment when their dressing is removed. This tends to make them more anxious.
- Therapists encounter these wounds on a regular basis; however, 90% of patients have not. If the therapist shows that they are comfortable looking at the wounds, then the patient will feel less anxious. This is one reason for reading the operation notes before the patient's appointment.

Removing dressings

- Use a sterile environment. Ensure the repaired area (and distal to it) is supported to prevent gravity pulling on the repairs. This is a good habit for the patient to adopt.
- Cut through the bandages on the side away from the wounds and peel back the dressings as this helps to reduce the spread of infection. If the dressing is stuck to the wound it may need soaking off with sterile water.
- Check the wound, is it:
  - Surrounded by red areas
  - Smelly
  - Healing as expected
  - White and macerated (a macerated wound is one which has got damp or sweaty and has become waterlogged)
  - Clean or dirty
  - Oozing or dry (palm wounds can be left open to allow for some ooze to escape)
  - In the expected place for the described operation?
- Record everything that is seen, including normal observations and those which will become objective markers. It makes it easier to recall the wound from notes when the patient next attends. The size of wounds should be recorded, especially any open areas.

Check the movement of the affected area

- This can be done by:
  - Checking the action of the tendons repaired to ensure they are intact
  - Tenodesis effect
  - Assessing the distance of the fingertips to the distal palmar crease
  - Measuring ROM with a goniometer.
- Reassure the patient at every stage that you will not ask them to do anything which would put the surgery at risk.

Check the sensation of the affected area

- Often this is not useful in the early stages, as any damaged nerves may be dying back. Recovery usually starts about four weeks after any repair.
- Sensation can be tested in the following ways:
  - Semmes Weinstein Monofilament testing (SWMF)
  - Two point discrimination
  - Temperature control
  - Sharp/blunt
  - Light touch
  - Vibration
  - Tinel's test.

Ongoing assessment

- Following the initial assessment issues for ongoing consideration are:
  - Wound healing
  - ROM
  - Patterns of movement and compensatory movements
  - Changes in symptoms
  - Function
  - Grip and pinch strength
  - Scars
  - Oedema.
- The individual patient and surgery will determine which are priorities when it comes to ongoing assessment, e.g. if a nerve has been repaired, then changes in symptoms, i.e. loss of sensation and patterns of movement may be more useful than pure ROM.

Specific reconstructive surgery and repairs

Replanted digits

- These can include injuries to bones, skin loss, tendon damage, nerve damage and vessels such as the digital arteries and veins, and the common digital vessels.
- A patient will be in hospital for at least a week, to ensure that the finger is 'viable', i.e. it has a good blood supply both in and out of the finger, preventing necrosis.
- Sometimes patients need multiple operations, so the more mobile they get between anaesthetics, the fewer complications occur.

Skin grafts and muscle flaps

- For defects that have a vascular base and are small enough, a skin graft of varying thickness can be used to close and cover the wound. Muscle flaps are used to cover a defect which does not have a good vascular base.

Skin grafts

- These can be full thickness (down into the dermis) or split thickness (upper layer of skin only).
- The amount of contracture depends on the amount of dermis which is lost. More dermis = more contracture, large defects covered by a skin graft will tend to develop unwanted contractures, affecting later function.
- Skin grafts are taken from areas of the upper thigh, forearm, upper arm or torso. These are called 'donor sites' and heal spontaneously by epithelialisation of the skin cells within 12–14 days.
- Due to the nature of the donor site, these can often be more painful than the graft site as there are exposed nerve endings.

- The skin graft is shaved off the donor area, using either a hand tool or a power dermatome knife. It is then meshed to allow expansion (to cover a larger area) and to allow oedema to escape. It is held in place on the graft site using glue or staples (Figure 4.6).
- The donor site is covered with mefix, which stays in place for 12–14 days.

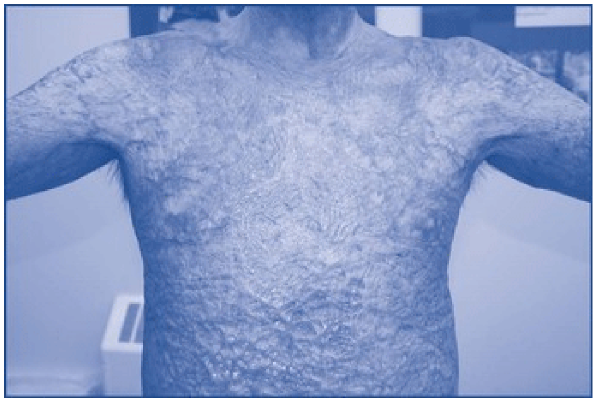

Figure 4.6 Skin graft.

Muscle flaps

- A muscle flap would be used if there is exposed bone or tendon, or if the defect is too large to be closed with a skin graft.
- The surgeon has to take into account the action that that part of the body has to undergo, e.g. the elbow needs to flex/extend, whilst the back has to undergo much less skin movement. They may cover open tibial fractures, following fracture fixation, or 'fill in a gap' following extensive malignant tissue removal.
- A muscle flap can be free or pedicled, which either means that it is transferred 'free' of its own blood supply, or still fixed to its own blood supply (Table 4.3). If it is a free flap then the flap is anastomosed (fixed) to the blood supply around the affected area. The surgeon needs to ensure that the blood supply at the affected site is adequate, and that the vessels are able to supply the anastomosis.
- Departments have different systems for managing muscle flaps. This may be a 'dangling' protocol, which involves the patient staying on bed rest with the arm/limb in elevation for 5–7 days.
- During this time the therapist would be expected to:
  - Monitor respiratory function
  - Provide a bed exercise programme
  - Maintain movement in all unaffected joints
  - Assess (alongside OTs) the social situation and start making plans for discharge.
- Following a period of bed rest following surgery for a lower limb the patient is encouraged to dangle the leg off the edge of the bed, with the flap being checked to

ensure it copes with the influx of blood to the dependent limb. This is begun at 30-second intervals and is increased to 5 minutes over the following 3–5 days.

- Once the patient has passed this point (either with or without dangling), then they will require assessment relating to:
  - Mobility
  - Social environment and subsequent discharge planning
  - Exercises for ROM and strengthening, dependent on the time since surgery and other concurrent injuries
  - Oedema management, scar management and continuing mobility dysfunction or compensatory movements.

Table 4.3 Common muscle flaps

Type of muscle flap	Commonly used for
DIEP (deep inferior epigastric artery) or TRAM (transverse rectus abdominus myocutaneous) flap	Breast reconstruction
Gracilis muscle flap	Lower limb trauma and reconstruction with smaller defects
Gastrocnemius muscle flap	Lower limb trauma and reconstruction requiring more cover
Latissimus dorsi flap	Breast reconstruction Back defects Shoulder or upper arm reconstruction

Breast reconstruction

- Women who have experienced breast cancer and have had a single or double mastectomy may opt to have a reconstruction.
- A reconstruction has been shown to:
  - Improve mental health
  - Improve emotional well-being
  - Improve energy levels
  - Give more satisfaction with their appearance following a mastectomy.
- However, there are some who choose not to have a reconstruction due to:
  - They feel the flat chest reflects their post-cancer personality better
  - They find it difficult to discuss the options, and worry about appearing vain
  - They cannot find a surgeon in whom they have confidence
  - They find it difficult to cope with more trauma following the diagnosis and treatment for the breast cancer.
- There are two main types of breast reconstruction; a prosthetic implant, or an autologous reconstruction, where skin or tissue from another part of the patient's body is used to reconstruct the breast. There are advantages and disadvantages to each procedure

(Tables 4.4 and 4.5), and the choice of surgery is ultimately dependent on patient preference.

Table 4.4 Advantages of prosthetic and autologous reconstructions

Prosthetic	**Autologous**
Quick, simple surgery	More natural look
Short general anaesthetic and recovery	Most durable reconstruction
No operation on healthy tissues	Best cosmetic effect
No extra scars	No artificial material used
No missing tissue from elsewhere	

Table 4.5 Disadvantages of prosthetic and autologous reconstruction

Prosthetic	**Autologous**
Slow reconstructive process with expansion of implants	Major operation
Less symmetry with remaining breast	Extra scars
Less natural texture	Complications at the breast and/or donor sites
Unsuitable for large breasts	Longer hospital stay
Increased risk of infection as artificial materials used	

Specific assessment following breast reconstruction

Post surgery

- Respiratory check and ongoing maintenance of chest.
- ROM shoulders, back and pelvis, and lower limbs.
- Mobility.
- Core stability once up and mobilising, this is particularly important if the patient has had a TRAM reconstruction.

Axillary, groin and neck dissections

- Axillary and groin dissections are commonly carried out to remove lymph glands from the area, or to remove adrenal sweat glands for a condition called 'hidradenitis' (excess sweating).
- This can involve extensive surgery around the region, requiring skin grafts or flaps in

order to close the remaining tissue.

- Neck dissections are more commonly done for cancer of the mouth, throat or neck itself. They are long operations, and with patients who may be weak as a result of their illness, careful monitoring is required post anaesthetic and following surgery.
- Surgery may involve the use of a radial forearm flap to reconstruct the palate or other parts of the throat or neck, and the hand therapist may be involved in hand and wrist protection in the initial stages which will be progressed to active treatment of the hand and wrist.
- These patients may need a tracheostomy, management of which requires respiratory knowledge and skills. They need to retain an open airway, therefore ability to assess a patient's saturation levels, heart rate (HR), respiratory rate (RR) and knowing the different types of oxygen therapy will assist in the overall assessment of these patients.
- With all dissection patients, the physiotherapist will need to assess:
    - ROM of the operated area and the joints above and below
    - Pain levels
    - Social situation
    - Patient's understanding of their condition. Being able to explain to a patient what they have had done requires skill and empathy. The physiotherapist may be the team member that is asked a lot of the questions that the patient did not ask the surgeon. It is important to have a good understanding of surgical procedures and postoperative routines to be able to provide the patient with the answers to any questions they may have.

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Additional resources

www.bapras.org.uk

www.breastcancercare.org.uk

www.britishburnassociation.org

www.cancerbackup.org.uk

www.cancerhelp.org.uk

www.changingfaces.org.uk

www.dansfundforburns.org

www.microsurgeon.org

www.plasticsurgery.org

All websites accessed 14 July 2011.

Chapter 4

E-materials

Author profiles

Clara Upson BSc(Hons) MCSP

Clara is an advanced physiotherapist working at Stoke Mandeville hospital in Aylesbury. Clara has ten years experience specialising in burns and plastics physiotherapy and she is a member of the BBA and also a regular attendee of the UK burns therapy network meetings.

Anne Alexander MSc BSc(Hons) MCSP MMACP

Anne has worked in Hand Therapy (plastics and orthopaedics) since 2003. She has been the Team Leader and Clinical Specialist in the Hands and Plastics Department of the John Radcliffe Hospital since 2007, following her MSc in Advanced Physiotherapy from UCL, London.

Anne manages an acute plastic surgery inpatient ward and a busy hand therapy and upper limb outpatient department, whilst providing specialist cover (along with her team) to other departments within the hospital and the surrounding areas.

Jane Leathwood Grad DipPhys MCSP

Jane qualified from Addenbrookes School of Physiotherapy in 1992. After completing her junior rotations she worked in the musculo-skeletal field until the opportunity arose to join the Plastic Surgery team at St Thomas' Hospital, London. Here she discovered her niche, and led the team, first as a Band 7 (Senior), then as a Band 8a (Superintendent). However, she eventually decided her managerial duties were taking her away from her clinical caseload for too much time, so moved to the Burns and Plastics unit at Stoke Mandeville Hospital, Aylesbury in 2004.

She is a member of the British Association of Hand Therapists (BAHT), has achieved her BAHT Level 2 accreditation as a hand therapist, and given a poster presentation at the Annual Conference. She is also a member of the British Burns Association, and attends study days in Burns and Plastics whenever possible. Along with Clara Upson, her co-author, she also enjoys the challenges of teaching all levels of the multi-disciplinary team in both specialities.

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Maria Clarke, Nicola Hyde and Joy Baria.

Appendix 4.1 Dressings

Superficial burns		
Dressings	Classification	How it works
Bactigras	Antimicrobial agent/low-adherent dressings	Used for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Siltex	Non-adherent dressing	Soft silicone used as primary wound dressing
Flamazine	Antimicrobial cream (contains silver sulfadiazine1%)	Prevention and treatment of wound infections at the site of burns
Glucan Pro Creams	Moisturising cream	Aid to skin recovery, assist pain management, moisture retention and itch relief
Inadine	Antimicrobial agent/low-adherent dressing	Indicated for prophylaxis and treatment of infection
DuoDERM	Hydrocolloid, semipermeable dressing	Used in the treatment of lightly exuding burn wound. Produced moist conditions under the dressings that promote epithelialisation without causing maceration
Trimovate	Steroid, antibiotic and antifungal	Helps reduce swelling and irritation. Fights certain bacterial and fungal infections of the skin
Allevyn	Adherent/foam dressing	Used for moderate to highly exuding wound
Betadine	Antiseptic solution (10% water)	Used to prevent wound infection
Partial-thickness burns		
Dressings	Classifications	How it works
Flamazine	Antimicrobial cream (contains silver sulfadiazine1%)	Prevention and treatment of wound infections at the site of burns
Flammacerium	Antimicrobial cream (unlicensed medicine)	Prevention and treatment of infections of severe burns. Promotes rapid formation of eschar which provides mechanical protection for the healing wound
Trimovate	Steroid, antibiotic and antifungal	Helps reduce swelling and irritation. Fights certain bacterial and fungal infections of the skin

Granugel	Hydrocolloid gel	Creates moist healing environment, helps to promote natural autolytic process of debridement
Inadine	Antimicrobial agent/low-adherent dressing	Indicated for prophylaxis and treatment of infection
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Acticoat	Antimicrobial barrier/low-adherent (silver coated)	Exhibits pronounced antibacterial activity against wide range of Gram-positive and Gram-negative bacteria and also effective against strains of yeasts and fungi
Biobrane	Adherent/semipermeable biosynthetic silicone dressing (derived from pigs)	Controls water vapour loss and provides a flexible adherent covering for the wound surface allowing joint movement and early ambulation and minimises the proliferation of bacteria on the wound surface by minimising dead space
E Z Derm	Biosynthetic wound dressing	Acts as temporary protective wound barrier that allows natural healing process to continue undisturbed
Tegapore	Low-adherence dressing	Allows the passage of exudates from the wound to a secondary absorbent dressing of choice
Full-thickness burns		
Dressings	Classification	How it works
Bactigras	Antimicrobial agent/low-adherent dressings	Used as a primary wound dressing for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Siltex	Non-adherent dressing	Soft silicone used as primary wound dressing
Flamazine	Antimicrobial cream (contains silver sulfadiazine1%)	Prevention and treatment of wound infections at the site of burns
Flammacerium	Antimicrobial cream (unlicensed medicine)	Prevention and treatment of infections of severe burns. Promotes rapid formation of eschar which provides mechanical protection for the healing wound
Granugel	Hydrocolloid gel	Creates moist healing environment, helps to promote natural autolytic process of debridement

Tegapore	Low-adherence dressing	Allows the passage of exudates from the wound to a secondary absorbent dressing of choice
Skin graft		
Dressings	Classification	How it works
Tegapore	Low-adherence dressing	Allows the passage of exudates from the wound to a secondary absorbent dressing of choice
Bactigras	Antimicrobial agent/low-adherent dressings	Used as a primary wound dressing for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Acticoat	Antimicrobial barrier/low-adherent (silver coated)	Exhibits pronounced antibacterial activity against wide range of Gram-positive and Gram-negative bacteria and also effective against strains of yeasts and fungi
Betadine	Antiseptic solution (10% water)	Used to prevent wound infection
Tegapore	Low-adherence dressing	Primary wound dressing. Allow the passage of exudates from the wound to a secondary absorbent dressing of choice
Bactigras	Antimicrobial agent/low-adherent dressings	Used as a primary wound dressing for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Non-invasive scar management		
Dressings	Classification	How it works
Dermatix	Topical silicone gel	Effectively treats and reduces scarring. It is clinically tested and proven to soften, flatten and smoothe scars, relieving the itching and discomfort
Mepiform	Self-adhesive soft silicone dressing (waterproof dressing)	Designed for the management of both old and new hypertrophic and keloid scars. Facilitates application and retention of the dressing to intact skin, but does not cause epidermal stripping or pain on removal
Burns reconstruction + negative-pressure therapy (Vac/Vista therapy)		
Dressings	Classification	How it works
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue

Duoderm	Hydrocolloid, semipermeable dressing	Used as a primary dressing applied to the surrounding wound surface to protect skin from maceration during therapy
Opsite	Semipermeable film adhesive dressing	Provides a sealed environment to the dressing during negative-pressure therapy
Matriderm	Collagen elastin matrix for dermal regeneration (obtained from bovine dermis)	A dermal substitute to improve the quality of the reconstructed skin, to reduce scarring and prevent wound contraction
Integra	Single layer/bilayer membrane system used a template for dermal regeneration	Facilitates formation of dermis and upon vascularisation, skin graft (epidermis) is placed over. Cells grow and form a mature epidermis thereby closing the wound and resulting in a functional dermis and epidermis

Joy Baria, Burns Nurse SMH September, 2010.

Case Study 4.1

Background

- A 28-year-old, male, works as a hospital porter.
- Non-smoker. Lives with wife.
- Physically well prior to the injury.
- Right-handed.
- Hobbies include gym, football.

HPC

- The injury was sustained when his clothes ignited from a bonfire.
- The flames were extinguished by a neighbour.
- The patient presented to A&E with burns to his chest, abdomen, both upper limbs and hands.
- No other first aid as administered and he was taken by ambulance to the A&E department of the nearest hospital with a burns unit.

Objective assessment on admission to the burns unit

- No additional injuries were found.
- GCS 15/15.

- Burns were assessed as 40% TBSA full-thickness burns and documented using a Lund Browder chart.
- Circumferential burns to both upper limbs required fasciotomies.
- Patient was commenced on fluid resuscitation and a NG feed.

PMH

Nil

DH

Nil

Surgical management

- Day 1 – Debridement and SSG to burns on both upper limbs and hands.
- Postoperatively hands were splinted in a position of safe immobilisation (POSI) and both upper limbs were protected with thick bulky dressings with elbows in a position of extension to limit movement of grafts.
- Day 3 – Debridement and SSG to burns on chest and abdomen.
- Postoperative bulky dressings to chest and back.
- Donor skin was taken from both lower limbs and back.

Identified goals and treatment plan – acute stage

Initial problems

- At risk of loss of range of motion of shoulders, elbows, wrists and hands due to skin grafting.
- General weakness and loss of muscle strength.
- Bulky dressings on arms, hands, chest and abdomen.
- Goals to maintain full passive ROM of upper and lower limbs and to initiate early mobility.
- Pain on certain movements.

Acute stage treatment (inpatient)

- The patient was well motivated and understood the importance of the goals set and the need to maintain joint ROM post grafting.

- On day 2 he was able to transfer from bed to chair with assistance of 2.
- Daily passive movements to upper limbs and hands were commenced once grafts were checked at 5 days postoperative and doctors were happy with graft take.
- Exercises were initially performed with dressings down and under direct vision to prevent damage to fragile grafts.
- The physiotherapists liaised with nursing staff regarding change of dressings and timing of his analgesia, and with the OTs, who fabricated thermoplastic night splints for his hands to continue to maintain a resting safe position.

Intermediate rehabilitation (inpatient)

- Lower limb strengthening with and without weights.
- Transfer practice and independent mobility.
- Hand functional assessment.

Goals set

- Lower limb muscle strength 4/5 by D/C.
- Independent with all transfers.
- Independent mobilising and completed stair assessment by D/C.
- Full active ROM of all joints affected.
- Full independent function.
- Psychological assessment.

Later stage treatment (outpatient)

- Pressure garments to keep the scars flat and pliable.
- Moisturising cream and massage to maintain elasticity to the skin.
- Protection from sunlight to reduce hyperpigmentation and sunburn.
- Silicone gel to soften and help scar flattening.
- Management of itching with creams, massage and cooling.
- Splintage – static elbow night splints to maintain elbow extension.
- ROM exercises and stretches to maintain joint ROM and limit contractures.
- Muscle strengthening.

Outcome

- By week 3 the patient was discharged home.
- He was independent in all functional tasks, and independently mobile.
- He was motivated to continue a vigorous home exercise programme and continued physiotherapy as an outpatient.
- He has a scar contracture of his right axilla that limits full shoulder movement and will

require surgical release.

Case Study 4.2

Background

- A 40-year-old man.
- Lives with his wife.
- IT worker.
- Non-smoker.

Presentation in A&E

- Patient was admitted following a house fire.
- The patient was covered in soot.
- He had soot in his sputum and singed nasal hairs.
- He had sustained burns to his face, upper and lower limbs, TBSA 30%, mostly full thickness, this was documented on a Lund Browder chart.
- The patient was assessed in A&E and intubated due to the clinical signs of an inhalation injury.
- Fluid resuscitation was commenced and he was transferred to ITU.

Day 2 on ITU

- A bronchoscopy was performed to clear sticky sooty secretions, which were continuing to be a problem.

Observations

CVS – stable BP of 112/65, pulse 106, in sinus rhythm. CVP 10.

Resp – Ventilated on SIMV, Intubated with size 8 ETT, RR 16, FiO2 0.5 TV 620ABG's see below.

Renal – steady urine output.

Neuro – level of consciousness 'V' on AVPU.

Symptoms – wheeze, cough on suction, sooty and purulent sputum.

PMH

- Nil of note – normally fit and well.

Current medication

- He was sedated on Propofol.
- Morphine infusion for analgesia.
- Nebulised Ventolin.
- NG feed.

Investigations

- ECG: some arrhythmias.
- COHb: indicates high exposure to CO.
- Cardiac enzymes: increased due to widespread muscle damage.
- Electrolytes: hypokalaemia.

Arterial blood gases

- On admission:
  - pH = 7.24
  - $PaCO_2$ = 2.60 kPa
  - PaO_2 = 11.2 kPa
  - HCO_3 = 7.8
  - BE = −16.4
  - SaO_2 = 93%
  - COHb = 20%
  - FiO_2 = 0.60.
- On day 2:
  - pH = 7.22
  - $PaCO_2$ = 5.35 Pa
  - PaO_2 = 10.1 kPa
  - HCO_3 = 20.2
  - BE = −4.6
  - SaO_2 = 93%
  - FiO_2 = 0.5.
- Implications of blood gases
  - Day 1 – metabolic acidosis.
  - Day 2 – metabolic acidosis with a respiratory component.
- The chest X-ray showed right lower lobe collapse and/or consolidation.

At the bedside

Observations

- The patient was lying supine, he was sedated and ventilated.
- His respiratory rate was 16.
- Chest expansion was noted to be equal on palpation.
- He had dressings round his arms and legs.

Auscultation

- There were reduced breath sounds at both bases with a marked expiratory wheeze.

Main problems

- Carbon monoxide poisoning.
- Hypovolaemia.

Physiotherapy problems

- Smoke inhalation injury, leading to:
  - Sputum retention
  - Marked brittle airways resulting in bronchoconstriction
  - Burns to face, back and limbs.

Aims of acute treatment

- Reduce sputum retention.
- Improve air entry and ensure adequate ventilation.
- Maintenance of limb movements whilst sedated.
- Prevention of ARDS.

Early treatment

- MDT communication and goal setting were documented in line with the burns standards.
- Positioning to improve right lower lobe consolidation, avoiding head-down tilt because of facial burns and oedema.
- Gentle suction to clear thick sooty secretions, avoiding further airway trauma.
- Manual techniques including vibrations or percussion, as no burns over the chest.
- Manual hyperinflation providing using normal precautions.
- Installation of saline.
- Ensure treatment is coordinated with bronchodilators.
- Timing of treatment with adequate analgesia.

- Humidified oxygen.
- Development of thick green secretions indicating pneumonia, requiring prescribed antibiotics.
- Sputum samples ensure appropriate antibiotics are prescribed.

Musculoskeletal

- Passive movements and splinting required to maintain ROM of affected joints and prevent contractures (uppers limbs, lower limbs and face).
- Progression to active assisted and active joint range as able.
- Oedema around burns sites, requiring elevation of upper limbs and face.

Further treatment

Respiratory

- Further bronchoscopy to clear the sticky secretions.
- Progression to CPAP once the patient is stable.

Surgical management

- The burns were mainly full thickness and sooty requiring surgical debridement and grafting, therefore multiple surgery and anaesthetics.

Musculoskeletal

- Progression of ROM exercises and strengthening.
- Assessment of transfers and mobility was carried out once the patient was more stable and weaned off the ventilator.

Psychological issues

- Were addressed with a psychology assessment.

Outcome

- The patient spent four weeks on ITU and then was transferred to the burns unit.
- With ongoing treatment he has returned to pre-injury level of function and returned to work.
- The case study highlights the importance of early physiotherapy interventions for respiratory care whilst patients are ventilated on ITU.

Case Study 4.3

Background

- 30-year-old female, right-handed.
- Smokes 20/day.
- Lives with partner and young daughter.
- Unemployed at present, partner works.
- Hobbies include gardening.

HPC

- Admitted to specialist surgery ward via ED following attempted suicide cut to volar left wrist.

PMH

- Depression.
- Nil else of note.

DH

- Venlafaxine – antidepressant.
- Amitriptyline.
- Sleeping tablets.
- Nil else of note.

Surgical management

- Went to surgery 5 days post injury.
- Had a repair of:
  - 90% division ulnar nerve
  - 50% division median nerve
  - 100% division FCU
  - 75% division FCR
  - 100% division FDP all fingers
  - 100% division FDS all fingers.
- Wound closed with dissolvable sutures.
- Placed into dorsal hood made from POP and bulky dressing.

- Advised to touch fingers and move as able within the dressings.

Initial problems at first assessment (2 days post surgery)

- Patient still on ward as requiring high level of psychiatric input.
- Pain in the hand and fingers.
- Loss of protective sensation due to nerve damage.
- At risk of contractures to webspace (due to median nerve being affected and APB weakness) and to fingers (loss of lumbricals due to ulnar nerve damage; and extensive tendon damage).
- Very dry skin with some loss of tactile gnosis to fingertips of ring and little fingers.
- Issues with wound healing due to smoking, and nerve damage.

Initial assessment and treatment

- Physiotherapists removed bulky dressing and POP, protecting the tendon and nerve repairs.
- Cleaned wound using aseptic technique and redressed with light dressing.
- Thermoplastic dorsal hood made from Ezeform TP.
- Advice and explanation given (with sheet) to wear splint continuously 24/24 hours and how to care for splint.
- Advice given regarding skin care – moisturising and protecting from cold/heat.
- Early active movement exercises given (with sheet). To do 3× every 2 hours.
- Sensory re-education retaught (sheet given).
- Education and reassurance given regarding nerve and tendon healing, what she can expect in the next few weeks, and overall prognosis.
- Loss of sensation to ½ middle finger, ring and little fingers. Pins and needles to the thumb.
- Full passive flexion all digits into palm.
- Lacks extension in ring and little fingers due to pain.
- Has good isolated glide of FDS and FDP to all digits.
- APB and lumbricals present.

Second treatment (1 week later)

- Started on Gabapentin yesterday due to increase in burning, shooting pains to hand.
- Splint rubbing ulnar border of hand – adjusted.
- Full extension all digits to splint.
- Full active flexion, tips to palm.

- APB present but weaker than previously.
- Added scar massage with cream to scar site – sutures dissolvable.

Goals set

- To maintain and improve ROM.
- To continue with sensory re-education and desensitisation exercises to enhance nerve recovery.
- Return to full function, even if this does not equal full ROM.
- Reduce smoking.

Later stage treatment

- Once out of splint (6/52), started light ADLs, gradually progressing to full ADLs at 12/52.
- Lost extension in the ring and little fingers due to clawing position of MCPJs – related to loss of lumbricals following ulnar nerve injury.
- Night extension splint made for ring and little finger.
- Anti-claw splint made for wearing in the day.
- Continued advice to protect fingers – occasionally burns the ring and little fingers.
- Continue with sensory re-education and fine dexterity tasks – drops small objects as cannot feel them.

Outcomes

- Lacking 20° extension at ring finger PIPJ, but not wearing anticlaw splint and this does not affect her function.
- Grip right side 30 kg, left side 20 kg.
- Still loss of protective sensation to ring and little fingers, patient adapting so not affecting function and no longer injuring the hand.
- Returned to voluntary work in garden centre – involves potting plants and moving heavy items.

Chapter 4 Burns and plastics: multiple choice questions

1. What is one of the signs of an inhalation injury?
    a). Persistent cough
    b). Green sputum
    c). Soot round nostrils
    d). Cherry red lips
2. Which of the following is not a sign of burns shock?
    a). Hypotension

b). Tachycardia
c). Rapid respiratory rate
d). Warm distal extremities

3. In what position should a patient with facial oedema be nursed?
a). Sitting upright
b). Supine with head elevated
c). Side lying
d). Tilted slightly down

4. Which treatment is contraindicated in the presence of a split skin graft on the anterior chest?
a). Suction
b). IPPB
c). Passive movements of the upper limbs
d). Vibrations

5. What may be a late complication of burns round the elbow joint?
a). Osteoarthritis
b). Osteoporosis
c). Heterotopic calcification
d). Tendon rupture

6. Which is least likely to be part of the emergency management of a patient admitted with a major burn?
a). Fluid resuscitation
b). Escharotomy
c). Pain relief
d). Mobilisation

7. In the first few days after skin grafting, affected joints should normally:
a). Be vigorously exercised
b). Have daily dressing changes
c). Have a gentle exercise programme
d). Be rested in a 'safe' position

8. Without exercises and stretches a full-thickness burn to the dorsum of the hand is most likely to result in:
a). A flexion contracture
b). Loss of wrist flexion
c). Loss of passive extension of fingers
d). Difficulties with composite flexion

9. What treatment can help to cosmetically improve hypertrophic scars in the burns patient?
a). Heat
b). Pressure therapy
c). Ice
d). Rest

10. What should a burns patient be encouraged to do after discharge from hospital?
    a). Rest
    b). Return to work immediately
    c). Continue a vigorous home exercise programme
    d). Wearing splints continuously
11. When would a patient ideally see a therapist following a tendon repair?
    a). After 2 weeks
    b). 5–10 days
    c). 1–5 days
    d). 10–15 days
12. The position of safe immobilisation protects the:
    a). Bones
    b). Ligaments
    c). Tendons
    d). Feet
13. If there is more dermis in a skin graft it means there will be:
    a). More contractures
    b). Fewer contractures
    c). No effect
    d). More laxity in the skin
14. A radial forearm flap is commonly used to treat the:
    a). Legs
    b). Feet
    c). Mouth
    d). Eyes
15. Dressings on hand wounds should be:
    a). Bulky
    b). Non-existent
    c). Light
    d). Tight
16. Splints are created:
    a). To be taken off whenever the patient thinks they should
    b). To provide a safe environment for exercise and rehabilitation
    c). To stop patients from exercising
    d). To stretch early tendon repairs
17. Dynamic splints:
    a). Have moving parts
    b). Should never be used
    c). Are very soft and malleable
    d). Are rigid
18. Early touch of the affected area after a nerve injury:
    a). Increases cortical reorganisation

b). Does not affect the brain
c). Is too painful for patients ever to tolerate it
d). Decreases cortical reorganisation

19. When treating CRPS you should always:
    a). Only use one treatment modality
    b). Never treat it
    c). Use a multi-modal treatment approach
    d). Only treat using one modality at a time
20. Mirror therapy:
    a). Works due to brain plasticity
    b). Does not work at all
    c). Constantly increases pain
    d). Works on everybody

Burns and plastics multiple choice answers

1. c)
2. d)
3. b)
4. d)
5. c)
6. d)
7. d)
8. d)
9. b)
10. c)
11. c)
12. b)
13. a)
14. c)
15. c)
16. b)
17. a)
18. d)
19. c)
20. a)

Chapter 5

Community Paediatrics

Introduction

- Community paediatrics involves the assessment of children from neonatal age through to 19 years, with conditions ranging from specific foot problems to complex neurological conditions.
- It is important to have a basic knowledge of child development, milestones and normal movement patterns, knowledge of primitive reflexes and righting reactions.
- The assessment will require the selection of assessment techniques and knowledge that are used in other specialist areas, especially outpatients, orthopaedics, respiratory and neurology.
- To be effective the paediatric physiotherapist has to work with delicately balanced and integrated relationships between children/young people, their parents/carers, educational requirements, medical and therapy needs, personal objectives and anyone else involved in the management of the children.
- These may lead to areas of conflict, which will need to be managed through careful negotiation and all need to be included in planning the development of appropriate goals and functional outcomes, to enable individuals to meet their full potential.

Venues and appointment times

It is essential to choose a venue to work with children/young people that:

- Has suitable access for wheelchairs, buggies.
- Has a child friendly atmosphere.
- Ensures the safety of both child and therapist.
- Considers travelling distances for families and keeps them to a minimum.

There are a variety of venues a community therapist may work in:

- Child's own home.
- A children's centre, nursery or play group.
- Mainstream school with or without resourced support from the local education authority (LEA).
- Special school.

- Community clinic.
- Some therapists may even consider working in a local gym or other community resources.
- It is also useful to consider the time that an appointment is offered to fit in with family commitments, such as work times for single parents, times other children may need support, e.g. collecting them from school or feeding a baby.

Consent

- Consent is essential, involving parental consent and also the consent of individuals.
- Therapists often need to consider inventive ways to explain the nature of their assessment and intervention and why it is important, especially to younger children and those with learning difficulties.
- Often a compromise is essential in order to achieve therapy which is effective and efficient, yet compliments the commitment that is made by children and/or those working with them.
- Therapy is often considered to be something that needs to happen 24 hours a day, 7 days a week, being taught and managed by a therapist, but implemented by many others.
- It is especially important to gain parental consent when planning to see a child in school with education staff.
- Children and adolescents often have very strong feelings and may make it clear they do not wish to participate in therapy programmes. It is therefore necessary to try to make treatment sessions fun, but also relevant to meeting set objectives.
- Children should be encouraged to take responsibility for their own therapy if this is possible.
- All health and social care organisations have guidelines or policies on consent. It is essential for any physiotherapist working in this field to familiarise themselves with these from the outset of the time they are working in community paediatric practice.

Child protection/safeguarding

- Child protection is very high on the agenda of everyone who works in paediatrics.
- Closely linked to nationally driven policies and procedures all health and social care organisations offer essential training to support therapists in this area.
- These are in place not just to protect children, but also to protect those working with them.
- There are many forms of abuse that children can be subjected to and a therapist working with children will often be the first to identify a possible problem.
- It is the responsibility of the individual to ensure that they attend child protection training as a priority to equip themselves with the knowledge to identify and handle these situations correctly.

- It is important to remember initiating a child protection procedure or a Common Assessment Framework (CAF) does not mean that children will be taken away from their families, very often it will flag up that a family needs help and identifies how it can be provided.
- All therapists are in a position of trust, but it is prudent that a physiotherapist does not put themselves into a situation where they are working alone with a child.
- As therapists we often handle children, ensure people know what you are going to do and why and if they find this unacceptable look for another way or even a completely different activity.

Manual handling and risk assessment

- It is an essential part of therapy practice to ensure the safety of those we work with and ourselves. All trusts have robust policies and procedures to ensure safe practice and it is an individual therapist's responsibility to ensure that they attend patient handling training and relevant updates on a regular basis (CSP 2008).
- A risk assessment will need to be completed for any therapeutic handling procedure to ensure any risk to the health of the therapist or the child is reduced as far as is reasonably practicable.

Statements of special educational need

- For those children with a physical difficulty, integrating therapy programmes into many education settings can often be tricky.
- If a child has a statement of special educational needs (this is a legally binding document that requires the LEA to provide specific support over and above that provided for most children, in terms of extra finance and consideration of appropriate school placement) to support their passage through school.
- It is essential to ensure that a physiotherapy report is included within this.
- There will be opportunities to outline what a child is able to do and where and what kind of help they will need to develop physical and mobility skills in their school setting.
- If they are going to need postural support equipment in school this is the time to say so, pointing out when and for how long it should be used and who would be expected to pay for and maintain it.
- At this point the physiotherapist will be expected to say how much 'hands on' therapy support the child should expect to receive to meet their full potential.
- It must be pointed out that it may not be possible to provide the desired frequency of therapeutic input.
- Therapy and health issues are usually placed in part 5 of a child's statement and cannot be challenged at an educational tribunal.

- If parents have issues with therapy provision as it stands in a statement they need to take this up with your organisation/trust.
- It must be realised that it is not the personal responsibility of the physiotherapist to provide what is outlined in the statement.

Physiotherapy in mainstream schools

- For most schools therapy is usually not a primary consideration.
- Often integrating this into a busy school curriculum is a real juggling act and gets harder the further a child progresses through the school system.
- It is surprisingly difficult to convince teachers that if a child has completed their physiotherapy programme they are more prepared and comfortable to apply themselves to learning.
- Another case needs to be made for placing the child in an appropriate piece of postural supporting equipment because this will enable the child to complete tasks more effectively and efficiently.

Physiotherapy in a school setting

- In a school setting it is relatively easy to integrate therapy into the fun learning situations which are created for younger children.
- Most education staff are happy to do so if you explain to them how and why.
- However with brighter children school staff often feel that time should be spent specifically on learning rather than on time-consuming therapy-related activities, however integrated they may be, especially as they grow older and school targets become more important.
- There are issues associated with placement in a nursery or school. These are wide ranging and will change as a child grows and expectations change.
- It is essential to provide specific training for staff and equipment to enable a child to be able to sit, stand, mobilise and function in a way that is not hazardous to themselves, other children or staff.
- As a child progresses through education there are issues of negotiating a larger building with dispersed classrooms on multiple levels.
- Appendices 5.1, 5.2 and 5.3 cover some of the commonly encountered issues in nurseries and in schools with suggestions for how these can be managed satisfactorily.

Assessment of the child

- It is helpful to be familiar with specific classification and assessment tools such as;

- Gross Motor Function Measure (GMFM)
  - Gross Motor Classification System (GMFCS)
  - Movement ABC
  - Paediatric Evaluation of Disability Inventory (PEDI)
  - Chailey
  - Pain assessments
  - Assisting hand assessments.
- These are useful once the main problems of the child have been established.

Please see chapter 1 for additional material on motor disorders

Referral process and preparation for the assessment

- Every community paediatric service will have a 'new referral' procedure and it is important to be familiar with this.
- Always check that the contact details on a referral are correct.
- If speaking to the family on the phone prior to the assessment confirm information such as;
  - Child's name and date of birth
  - Address
  - Contact number
  - GP details
  - School
  - Other professionals involved
  - Equipment.
- Explain what the assessment appointment will involve, give the parents your contact details and inform them how to cancel the appointment should it become necessary.
- Arrange a convenient appointment with the family; try not to see the child when it is due a sleep or is hungry as this is likely to affect willingness to cooperate and/or play.
- Before arranging to visit a child's home it is essential to be familiar with the service-specific lone-working policy.
- Before assessing a child access other medical records and/or have a discussion with other professionals involved with the child.
- It is also useful to research any presenting diagnosis in order to be well informed during the assessment.
- On the day of the assessment ring or text to confirm that the child will be attending.
- Parents often find it difficult to remember the age that their child achieved various milestones.
- The 'Personal Child Health Record', often known as the red book, has pages for parents to record their child's development and therefore it is useful if this is available during the

assessment.

Equipment to have at assessment

- Goniometer.
- Tape measure.
- Notepad and pen.
- Assessment forms if used by your service.
- Appropriate toys/activities for the child's age and cognitive ability.
- Gloves and apron and alcohol gel should be available.

Environment

- When planning an assessment consider the best environment for the assessment to take place.
- The environments available to you will largely depend on where in the community the child is assessed, e.g. school (SEN/mainstream), home, health centre.
- Wherever the assessment takes place it is important that the environment is warm and safe.
- Privacy is important as the child/young person may have to be undressed or the parents/caregivers may disclose confidential information.
- Consider Health and Safety; is a hoist required, would a therapy couch or mat be most suitable, will space be required to observe walking, running, jumping?
- Is the child likely to put things in its mouth?

Subjective assessment

Background information

- Obtaining a comprehensive history of the child's condition and progress to date will 'help' you to decide how to proceed with your assessment.
- Some of the information required can often be obtained from previous records.
- Discussion with the parents/caregivers and child, if they have the cognitive ability, will provide an insight into the child's general health, well-being and life skills.
- It will also establish expectations of the child, parents and school.
- Some questions may be upsetting for a family, especially if the assessment is before they have been given a reason for their child's difficulties or if they are anxious about their child.
- It is important that the family/carers and child understand the questions; therefore they should be concise and relevant, avoiding jargon.
- An interpreter is recommended if either parent is not fluent in English.
- Before the assessment it is good practice to explain what will happen during the

assessment and consent must be obtained before proceeding.

- Consent must be documented appropriately in accordance with local policies.

Questions

- What are the parents' main concerns?
- When did they first have concerns?

Birth history

- Any complications during pregnancy?
- Scan results.
- Labour; type, duration, complications.
- Apgar score at birth.
- Was baby given to mum immediately post delivery?
- Was baby with mum on ward?
- Discharge timing.

Developmental history

- Missing a developmental stage can influence a child's gross motor abilities, e.g. a child who does not crawl may have poor proximal stability.
- Achievement of milestones – smiling, rolling, sitting, crawling, pull to stand, walk.
- Has there been any regression in their abilities?
- Did the baby have time on its stomach?
- Did the child crawl?
- Did the child use a baby walker?
- Any difficulties with feeding?
- Any history of respiratory problems?

Medical history

- Diagnosis (if known)
- General health
- Other medical conditions such as epilepsy, asthma, reflux
- Surgery
- Investigations and results (if known) – including scans and X-rays
- Medications
- Orthotics
- Other professionals involved.

Family history

- Siblings? What ages, are they healthy?

• Incidence of similar conditions/difficulties within the extended family.
• Consanguinity.

Education

• Name of school/nursery attended – contact details of SENCO and LSA.
• Do they have an Educational Statement?
• Equipment used at school (including manual handling).
• How they manage in PE, lunchtime and playtime?
• Ease of accessing the school including how they manage between classes.
• Any specific difficulties.

Social

• Hobbies.
• Likes/dislikes.

ADL activities

• What do they find difficult?
• What would they like to be able to do?
• How much help does the child need during activities such as;
  – Mobility
  – Dressing/ undressing
  – Toileting
  – Eating.
• How well do they sleep?
• Do they use a sleep system?
• Are they in pain? – if so – where, how often, intensity what helps?

Objective assessment

• Observational analysis of a child's movement should occur whilst they enter the assessment area, in the assessment environment and during play.
• Observe:
  – Head, trunk, and limb posture
  – Eye contact
  – Movement patterns
  – Voluntary and involuntary movements
  – Influence of retained primitive reflexes
  – Symmetry
  – Balance
  – Ability to weight bear through upper limbs

– Transitions, e.g. movement from lying to sitting
– Fluidity of movement
– Muscle hypertrophy or atrophy
– Use of hands during activities and play:
  a. Communication skills
  b. Behaviour
  c. Relationship with parents and/or caregivers, and siblings present at the assessment.

- Observation gives the child time to adjust to the environment and enables a rapport to be developed between the therapist and child.
- Discover what type of activities or toys they like, before starting the assessment.

Physical assessment

- Ideally the child should be undressed; however, this may not always be possible, e.g. lack of privacy.
- Taking a young child from a parent's lap may upset the child significantly and curtail any physical assessment.
- It is possible to assess much of the child on the mother's lap and slowly persuade the child to partake in other activities.
- The activities chosen will depend on the child's age and ability.
- Analyse the quality of the function, not just the ability to succeed.
- The starting point of the assessment will depend on the child's ability and willingness to be 'handled'.

Supine

- Observe posture recording asymmetries.
- Record abnormal movements/posture, e.g. flexion, adduction and internal/external rotation of hips, thumb in palms, fisted hands.
- General feel of all limbs for joint range and muscle tone.
- Note any resistance and consider cause.
- Is the end feel normal, bony or due to soft tissue limitation?
- Is the direction of the movement normal?
- Measure active ROM using a goniometer and muscle strength using Oxford scale noting abnormality or asymmetry.
- If a child presents with increased tone, check for the dynamic ranges of muscles.
- Note any clonus.
- Check leg length.

Prone

- Observe posture, movement and asymmetries in prone.
- Prone is the best position to measure hip rotation, as it is easier to control movement at the pelvis.

Side lying

- For the child more severely affected by a neuromuscular condition assess whether the child can be placed in this position.
- Note if they are able to bring their hands to midline, together, and to their mouth.
- Does the child use side lying during their transitional movements?

Sitting

- Assess floor sitting as well as sitting on a stool/chair.
- Does the child have to be placed in these positions or can they achieve them independently?
- How much support does the child need to maintain the position, and where is the support required?
- Analyse posture and movement as for the previous positions.
- How good is head control?
- Does the child use fixation strategies to maintain the position?
- Is there a scoliosis or kyphosis and is it postural or fixed?
- How good is their balance, e.g. can they reach out of their base of support?
- Are they able to move in and out of sitting?

Assess and analyse other general gross motor activities as appropriate

- Floor mobility.
- Rolling.
- Crawling.
- Standing – check spinal posture.
- Sit to stand.
- Floor to stand – Check for Gower's sign.
- Walking – with and without orthoses.
- Transitions.
- Standing on one leg.
- Stairs.
- Running.
- Jumping.
- Hopping.
- Skipping.

- Kicking.
- Catching.
- Hand function; e.g. grasp, co-ordination, movement of wrist and fingers, writing.

Video recording

- Video recording can be useful to aid analysis of movement patterns, remember written consent must be gained from the parents first.

Sensory assessment

- The brain integrates information about sights, sounds, textures, smells, tastes and movements that are perceived in an organised way to assign meaning to sensory experiences and formulates response and behaviour accordingly.
- In the normally developing child sensory integration occurs when the child participates in everyday activities, with a child's love for sensory activities fuelling an inner drive and motivation to conquer challenges (Murray-Slutsky and Paris, 2005). A child explores the environment, tries new activities and strives to meet increasingly more complex challenges.
- Mastering new challenges gives a child the confidence to try more difficult tasks.
- Different responses:
  - Over responsive (hyper-responsive), a child registers sensation too intensely.
  - Under responsive (hyporesponsive), a child's sensory system is not responsive to information in their environment.
- The senses/sensory system:
  - Touch – tactile system
  - Sight – vision
  - Hearing – auditory system
  - Smell
  - Taste.
- Additional senses include proprioception and movement (vestibular).

Treatment planning

- On completion of the assessment it should be possible to identify a list of problems on which the treatment plan can be based.
- These may not be motor problems, e.g. they may be poor communication or severe epilepsy.
- These need to be documented as they may affect the treatment plan and also it is important that other members of staff are made aware of them.
- It is important to discuss findings with the child's parents/carers so that they can clarify

issues and gain a better understanding of the problems.
- Joint goal setting is very important as it gives the child and family ownership of the objectives; it also allows the child, family and physiotherapist to understand their personal commitments to the treatment plan.
- Identify whether the child needs referral to any other services and discuss this with the family.
- Assessment findings should be recorded in accordance with organisational and professional body requirements.
- A copy of the assessment should be sent to the parents and their consent gained for this to be distributed to other professionals.

Respiratory

- Children may have respiratory problems for a variety of reasons; some directly related to their condition, others as a separate issue.
- These could impact on their growth, development and health and will need addressing as part of the whole assessment.
- It is important to recognise respiratory dysfunction to provide early intervention and hopefully prevent admission to hospital.
- The primary purpose of a respiratory assessment is to determine the adequacy of gas exchange, which is oxygenation of the tissues and excretion of carbon dioxide.
- By undertaking a respiratory assessment in the community physiotherapists are in the position to act on findings and ensure that appropriate medical and/or physiotherapy interventions are initiated.
- The severity of the respiratory condition can vary greatly from having little or no impact on daily life to having a significant impact, which can lead to modification of individual treatment plans.
- It is important to understand the state of the condition, i.e. is it controlled and/or stable to uncontrolled and/or deteriorating.
- All respiratory conditions are monitored through GPs, or paediatricians, or respiratory consultants therefore good communication is necessary to be appropriately informed about any treatment decisions made by health professionals and parents, particularly with regard to resuscitation plans.

Ask, look, listen, feel, smell

Ask

- History:
  – Hospital admissions due to chest (how many?)
  – Family history of respiratory problems (e.g. asthma)

- Recurrent chest infections
- Breathing difficulties
- Failure to thrive
- Poor feeding (breathless or sweaty whilst feeding)
- Poor swallow
- Reflux
- Aspiration problems
- Exercise tolerance
- Cyanosis
- Episodes of apnoea
- Wheeze/cough
- ENT symptoms
- Drugs
- Mentation – child's state, i.e. anxious
- Previous chest X-ray
- Any other professionals involved for any of the above?
- Any equipment used for chest? Ventilator (night and/or daytime), Suction (when and how often is it used?). Nebulisers.

• Be aware of any agreed resuscitation plans for individual children.

Look

• General observation:
  - Well/unwell
  - Awake/alert
  - Increased drowsiness can lead to unconsciousness.
  - Distressed generally
  - Temperature (normal or raised)
  - Effort/work of breathing
  - Signs of respiratory distress. Children who have neuromuscular disease may present in respiratory failure without increased effort of breathing.
  - Chest deformity
  - Positioning
  - Rashes.

• Hands:
  - Clubbing of finger nails
  - Colour of finger nails
  - Tremor
  - Capillary refill
  - Radial pulse if possible
  - Nutritional state.

• Face:
  - Colour, generally of face

– Lip colour.

• Nose:

  – Blocked up nose
  – Snotty/red
  – Flaring nostrils
  – Abdomen (pushing out as child breathes out).

• Neck:

  – Lymph nodes
  – Trachea, is it central?

• Chest:

  – Ribs (looking more prominent as child breathes)
  – Recession, subcostal/intercostal
  – Harrison's sulcus – two symmetrical sulci, horizontal, at the lower margin of the anterior thorax, at the attachment of the diaphragm. A sign of prolonged respiratory distress in children. Most commonly present in children with asthma who have required an increased respiratory effort over several months.
  – Accessory muscle use
  – Oximetry if available
  – Gasping, call 999.

Listen

• Audible noise:

  – Sounds from the child/chest audible to ear is upper respiratory tract
  – Crackles (Rice Krispies)
  – Wheeze (whistling noise breathing out)
  – Grunting
  – Stridor (whistling noise breathing in).

• Auscultation if possible:

  – Appropriate-size stethoscope needed
  – Size and age of child
  – Musculoskeletal deformity
  – Breath sounds
  – Added sounds
  – Asymmetrical sounds
  – Pleural rub (squeaky).

• Cough:

  – Effective?
  – Productive?
  – Dry?
  – Fruity?

Feel (with hands)

- Chest movement:
  - Symmetrical movement
  - Inspiration
  - Expiration
  - Respiratory rate
  - Pulse/heart rate
  - Fremitus/crepitus = secretions.

Smell

- Odours:
  - Breath odours.

Signs of respiratory distress

- Breathing rate, rapid and shallow and an increase in the number of breaths per minute may indicate that a person is having trouble breathing or not getting enough oxygen.
- Heart rate, tachycardia (fast heart rate).
- Colour changes, a bluish colour seen around the mouth, on the inside of the lips, or on the fingernails may occur when a person is not getting as much oxygen as needed.
- The colour of the skin may also appear pale or grey.
- Grunting can be heard each time the person exhales.
- This grunting is the body's way of trying to keep air in the lungs so they will remain inflated, needs urgent attention.
- Nose flaring while breathing may indicate that a person is having to work harder to breathe.
- Retractions, the chest appears to sink in just below the neck and/or under the sternum with each breath – as the child tries to bring more air into their lungs.
- Sweating, may be increased on the head, but the skin does not feel warm to the touch.
- More often, the skin may feel cool or clammy, especially when the breathing rate is fast.
- Wheezing, a whistling or musical sound heard with each breath may indicate that the air passages may be constricted, making it more difficult to breathe.
- Irritability, there may be a change in mental state due to hypoxaemia, which leads to irritability in children.

Cardiorespiratory values

- Oxygen saturation 90–98% = normal range.
- Respiratory rates (breaths per minute) (Table 5.1).
- Heart rates (awake) (Table 5.2).
- Systolic blood pressure (mmHg) (Table 5.3).

- It is essential to know normal values of heart rate, respiratory rate (O_2 % if available) and patterns of breathing for the more severely affected children especially if a change of position has an impact on breathing.
- This status should be regularly monitored for change and/or deterioration (parents, carers and learning support assistants can be trained to recognise changes).
- Documenting values can provide evidence of patterns, changes and deterioration that can result in referral to paediatric clinic or justification for the purchase of equipment for managing respiratory conditions.
- Children are a diverse group of people. They vary enormously in weight, size, shape, intellectual ability and emotional response.
- Children are different to adults in the following areas:
    - – Weight
    - – Anatomical – size and shape
    - – Physiological – cardiovascular, respiratory, immune function
    - – Psychological – intellectual ability, emotional response.

Table 5.1 Paediatric respiratory rates (breaths per minute) (ALSG 2005)

Neonate	40–60
Less than 1 year	30–40
1–5 years	25–35
5–12 years	20–25
Older than 12 years	15–20

Table 5.2 Paediatric heart rates (beats per minute) (ALSG 2005)

Neonate	100–200
Less than 1 year	110–160
1–2 years	100–150
2–5 years	95–140
5–12 years	80–120
Older than 12 years	60–100

Table 5.3 Paediatric blood pressure values (mmHg) (ALSG 2005)

Neonate	60–90
Less than 1 year	70–90
1–2 years	80–95
2–5 years	80–100
5–12 years	90–110
Older than 12 years	100–120

It is important to note

- Absolute size and relative body proportions change with age.
- Observations of children must be related to their age.
- Therapy in children must be related to their age and weight.
- Special psychological needs of children must be considered.

Cardiac/respiratory arrest

- Cardiac arrest in children is rarely due to primary cardiac disease.
- This differs from adults where the primary arrest is often cardiac and circulatory and respiratory function may remain near normal until the moment of arrest.
- In children most cardiorespiratory arrests are secondary to hypoxia caused by:
  - Respiratory pathology
  - Birth asphyxia
  - Inhalation of a foreign body
  - Bronchiolitis
  - Asthma.
- Respiratory arrest also occurs secondary to neurological dysfunction caused by events such as:
  - Convulsions
  - Poisoning
  - Raised intracranial pressure (ICP), e.g. head injury or acute encephalopathy.
- Symptoms of nocturnal failure:
  - Daytime sleepiness
  - Behaviour changes
  - Morning headaches
  - Fatigue
  - Difficulty sleeping
  - Needing frequent re-positioning overnight.

Respiratory rate (RR)

- Increased respiratory rate indicates possible airway disease.
- Slowing or slow RR indicates breathing fatigue.

Recession

- As children have a more compliant chest wall (not as rigid as adults) any ↑ negative pressure in thorax will result in intercostal, subcostal or sternal recession.
- Greater recession = greater respiratory distress.

Stridor

- More pronounced on inspiration, but may occur during expiration.
- Indicates upper airway obstruction.
- Always consider possible foreign body inhalation.

Wheeze

- Wheeze may subside with exhaustion.

Grunting

- A grunting child indicates an attempt to keep the distal airways open by generating a grunt, i.e. positive end expiratory pressure.
- It is also a sign of increasing respiratory distress.

Accessory muscles

- A child may use the sternomastoid muscles to assist breathing.
- In infants this may lead to bobbing of their head.

Oximetry

- 95–100% on room air.
- Is this normal for the child?

Heart rate

- Bradycardia:
  - Defined as a heart rate (HR) below 60 or a rapidly falling HR with poor systemic perfusion.
  - Consider when to start cardiac compressions on a falling HR, i.e. below 50 with signs of poor perfusion.
- Tachycardia:
  - A heart rate that exceeds the normal range for a resting heart rate, due to; hypoxia, anxiety or fever.

Colour

- Hypoxia
  - Leads to peripheral vasoconstriction and eventually cyanosis
  - Once the cyanosis is evident centrally (think smurf) the child is close to respiratory arrest.

Mentation

- As a child's respiratory distress evolves they become anxious.

- Increased drowsiness and fatigue grows.
- Ask parents if this is normal.
- If parents are concerned then you should be.

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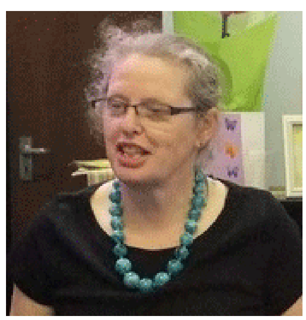
Chapter 5

E-materials

Author profiles

Sally Braithwaite MCSP

Sally qualified as a physiotherapist in 1978 from the Joint Services School of Physiotherapy and has worked with children for most of her career. Sally has had the opportunity to work in most of the specialist areas of paediatrics and as a result has a wealth of experience. Sally settled in Birmingham thirty years ago where she has worked predominantly in community settings. She has particular interests in children with developmental co-ordination disorders, and continues to see a large number of children with common and less common paediatric conditions. Sally is currently Professional Clinical Lead for Physiotherapy in Birmingham Community Healthcare NHS Trust, but will be retiring to spend time with her husband and five grandchildren, developing her garden, reading, painting and travelling as extensively as possible.



Karen Edwards MSc MCSP

Karen is now a clinical specialist physiotherapist working as part of the Movement Disorder Service at Great Ormond Street Hospital. She previously worked in the community setting for 20 years and has a particular interest in the orthotic management of children with movement disorders. She is an experienced clinical educator and has contributed to the undergraduate programme at University of East London.

Julia Hyde BSc(Hons) MCSP

Julia Hyde completed an Honours degree in biological sciences at the University of East Anglia before commencing physiotherapy training first at Withington Hospital, Manchester then qualifying from Addenbrooke's Hospital, Cambridge.

She has worked in Community Paediatrics for over 20 years in Oxfordshire.

She is Bobath trained, an iCSP paediatric moderator and the clinical governance, children's rights and clinical educator lead for her service.

Pauline Norris MCSP

Pauline qualified in 1990 from Coventry School of Physiotherapy.

She has worked as a Paediatric Physiotherapist since 1992 and has experience of both acute and community settings within the NHS in Buckinghamshire, Gloucestershire and Oxfordshire and has been Head of Physiotherapy for a residential school run by a charity.

Pauline currently works for the NHS in Oxfordshire with children with delay and disability. Her particular interests are Disability, Hydrotherapy, Cerebral Palsy and Developmental Co-ordination disorder.

Janine Rutland GradDipPhys MCSP

Janine started her career by training as an orthopaedic nurse followed immediately by training as a physiotherapist at the Prince of Wales School in London.

Rotations as a junior were completed at Ipswich General Hospital followed by a period as a senior clinician at Colchester General Hospital.

Following a career break to raise her two children Janine has specialised in community paediatrics working at the Avenue School in Reading for the last ten years.

Acknowledgements

Peter Evans, Tebbit Centre, Nuffield Orthopaedic Centre.

Appendix 5.1 Issues to consider in a nursery setting

	Possible barriers	Possible solutions

Daily therapy programmes	Time	Programmes constructed to integrate into nursery activities Some aspects of programmes to be delivered by parents at home
	Someone to carry out the programme	Several staff trained to deliver the programme so it can be shared In-service training for nursery staff delivered by therapist
	Training for staff	Attendance at relevant external courses Provision of a statement if special educational needs should provide financial support towards individual input for a child
Using postural management equipment	Finance	Funded via statutory or possibly charitable provision (health or education) Look for pieces of kit that may provide multiple functions Keep kit as small as possible
	Provision of equipment Storage space Manual handling training of staff for effective, efficient and safe use	Staff should attend manual handling training but a therapist should advise on use of equipment for individual children (how to get children in and out, the time equipment should be used for, how to check regularly to keep in good order, etc.)
Use of orthotics	Staff are afraid they might hurt a child Occasionally staff link orthotics to handling that they associate with child protection issues	Staff should be given very clear instructions on the use of orthotics – how they should be taken off and put on, duration of use, what to do if they have any problem
Use of mobility equipment	Crowded environment with lots of toys on the floor Staff are often initially worried that a child my fall	Choose kit that is stable and a child is fairly confident to use Practice therapeutic walking in a clear uncongested area Use a buggy or wheelchair in situations where it is just not safe to use walkers Ensure that staff are aware of policies to follow if a child hurts himself Teach a child how to get up from the floor and ensure staff know how this should be encouraged

Appendix 5.2 Some issues to consider in a primary setting

	Barriers	**Solutions**

Small and often crowded classrooms	Little space for the use of positioning equipment Difficulty moving around with mobility aids	Consider the place a child sits in the classroom Being near the door offers easy access and is nearer to a toilet should this be necessary in a hurry Use of equipment and mobility aids
Sitting on the floor	Not always possible to be able to work at the same height as peers If only able to sit with legs out, others may trip over and not enough space	Sit on a small chair Sit on a floor cushion used to mark a place with enough space Specifically identify a suitable space for a wheelchair or supportive seating which ensures safe access for the whole class
PE and swimming	Health and safety issues for both child and staff Child not able to keep up with peers Child cannot cope with the cold for some outdoor activities Not able to access standard equipment	Appropriate training for staff in both manual handling and differentiation of activities Alternative activities to do with a small group when it is cold outside Possible alternative activities – swimming or horse riding Plan, e.g. swimming, choose a pool with suitable access and ensure that pool staff are aware of the special needs of the child
Break and lunch times	Crowded situations where children often like to rush around Specific difficulties with controlling food in the mouth Difficulty managing dinner trays and cutlery	Health and safety training
		Liaise with OTs and SALT
		Position at the beginning or end of the queue Identify a place in which a wheelchair or supportive seating will fit
	May have some kind of tube feeding	Training for staff for tube feeding and the identification of a suitable place for this to happen
Personal care	Child protection issues Manual handling Access to toilets is often difficult	Appropriate training in many of these areas is essential OT advice re hoisting and suitable adaptations Track hoisting may help small space issues
	Unable to toilet independently Incontinence	More than one person trained to manage all personal care situations
	Catheterisation Unable to change independently for swimming or PE	Try to have PE or swimming first lesson of the day so children can come ready changed under their clothes

Appendix 5.3 Issues to consider in a secondary setting

	Barriers	Solutions
Access	Large sites with more than one building	Try to identify smaller schools Advice from OTs
	Multiple floors with many steps and stairs	Lifts
	Needing to change rooms for different lessons Specific furniture for labs, etc.	Consider timetabling, group lessons into 1 building or on 1 floor Extra time to move around Wheelchair accessible furniture
Increased demand on work output	Poor hand function Needing to use specialised equipment	Advice from OT Scribe for exams and everyday work Assessment for and provision of specialist kit with the training for staff and child – e.g. computers with tailored access
	Fatigue	Identified space for rest periods Shorter days Extra time to complete tasks
Peer pressure and no peer group	Poor understanding of disability	Specifically targeted PSME Not to be the only child with a disability in school

Case Study 5.1

Background

- John, a 12-year-old boy, lived with his parents and younger brother in a single storey dwelling.
- He was an active boy always playing football with his friends or out on his bicycle.

HPC

- John was knocked from his bicycle by a hit-and-run driver.
- He sustained a head injury including a fractured skull, multiple fractures of the upper and lower limbs and thoracic cage.
- John was taken by helicopter to the nearest trauma unit and was in ITU initially for 5 weeks.
- He was transferred to the rehabilitation ward and remained there for 4 months.
- John continued rehabilitation as an outpatient, and by 9 months it was thought that improvement from rehabilitation had slowed and that he would benefit from the teaching provided by a special school, where he would be able to receive intensive rehabilitation alongside his schooling.

School

- At this stage John had little in the way of independent function apart from head control and he had communication difficulties.
- The special school enabled John to have daily physiotherapy and to receive input from different specialists within the school.
- John showed significant improvement during the year in his function and ability to communicate and was showing signs of improving academic abilities.
- Therefore it was considered appropriate to transfer John back to his mainstream school as it was felt that this would provide the stimulus and challenge to enable him to maximise his potential.
- Planning and meetings were crucial to ensuring a smooth transition.
- The team necessary to support John included: physiotherapists, speech and language and occupational therapists, teachers and non-teaching staff, educational psychologists.
- A joint professional approach was important to ensure the provision of the required level of ongoing rehabilitation and treatment that John needed alongside the school work.
- The physio- and occupational therapists provided training for the school staff and helped to problem solve any issues involving the integration of John into the normal routines of the school.
- Following the preliminary meetings any equipment that had been identified as being required was ordered.
- The physiotherapist and one of the school staff began the process of preparing school staff for their roles in helping to integrate John back into the school.
- John made steady progress in his independent function, communication and academic abilities over a 2-year period.
- Ongoing therapy sessions at school and attendance at aquatic pysiotherapy sessions and rehab sessions outside of school meant that John achieved the ability to stand with support and walk with walking aids and the support of 2.
- John has a teaching assistant who is dedicated to him at school who is able to ensure school staff are updated on any new approaches to his management that are undertaken by the therapists in or outside of the school.

Summary

- Communication is the key factor in the successful management of a child such as John once they have been discharged from hospital.
- Involvement of school staff is essential to ensure that any rehabilitation requirements are fully understood by school staff and the aims of treatment are reinforced.

Case Study 5.2

Background

- Z was a 17-month-old boy referred to local children's services by his GP because of delayed motor development.
- On 2 previous occasions the GP had reassured his parents that he may be delayed because he is a boy and they generally are slower than girls.
- The referral was allocated by the referral panel to Physiotherapy only based on the GPs information stating 'developmental delay – not walking'.

Assessment

Observation

- In the waiting room, Z was supported by his mother in standing to enable him to play at a table. He was standing on his toes and patterns of movement in his upper limbs were of concern.
- He presented with significant plagiocephaly.
- In the assessment area Z was placed in long sitting with a toy between his legs by his parents.
- He presented with posterior pelvic tilt, bilateral hip internal rotation and adduction, and bilateral equinus.
- He was unable to play with the toy as he needed to use his upper limbs to maintain his posture.
- When unable to maintain his balance he fell backwards, displaying a startle reaction with both arms going into high guard position.
- There were no saving reactions.
- Once in supine he was unable to move from this position independently and became distressed.
- When supported in sitting on his mother's lap Z was happy to interact by smiling and making sounds.

Subjective assessment

- Pregnancy was uneventful and Z was born at term via normal vaginal delivery.
- Birth weight was 7lbs 4oz.
- Z was stiff from birth.
- He was awkward to dress and it was difficult to separate his legs to change nappies.
- Motor milestones were delayed (no rolling or crawling) and balance in sitting had only recently been achieved.
- He cried whenever in unfamiliar surroundings, especially if someone new walked into the room.

- Z seemed to get more frustrated and angry than other children his age.
- Other people could not understand his communication methods.
- Feet have always been pointed down.
- No vision or hearing problems.
- He preferred using one hand.
- Finger feeding picking up food between thumb and fist.

Objective assessment

- Smiling appropriately.
- A good understanding of simple instructions.
- Good relationship with parents.
- Visually exploring environment.
- Hypertonia in both upper and lower limbs; most evident in calf muscles and hip adductors.
- Limited passive range of dorsiflexors.
- Difficulty dissociating movement between one leg and the other.
- He was unable to roll, cried when assisted and was scared of movement when supine. Possibly not used to experiencing movement.
- He could be placed in sitting, but was unable to play in this position.
- He did not like being in prone as he was unable to push up on his arms.
- He had no form of independent mobility.
- Ability to use two hands. Hand preference evident with one hand predominantly fisted.

Treatment

- Findings were explained to parents and Z referred to Child Development Centre (CDC) for multidisciplinary assessment.
- Referral was made to occupational therapy for assessment for equipment, which would enable him to play in sitting.
- Referral made to speech therapy due to the delay in his communication skills.
- Advice was given to parents on activities to try to introduce movement to Z on the floor.
- Parents taught how to do calf stretches and advised to do these at every nappy change time.

Review 3 weeks later

- Parents reported they had worked on all activities advised, and included his sister and extended family in these activities.
- Z able to roll independently and beginning to push up in prone.
- No longer scared of being moved or moving on the floor.
- Able to move away from people who entered the room and he no longer cried.

CDC assessment at 21 months

- It was confirmed that he was presenting with a condition similar to cerebral palsy. Further investigations, e.g. blood tests and MRI brain scan were required.
- Parents were introduced to the Early Support Coordinator who provided them with information.
- The physiotherapist was nominated as Key worker due to the relationship he had with Z and his family.
- Family also introduced to services at local Children's Centre, including access to a playgroup for children with additional needs.
- The physiotherapist attended play group to advise staff on activities to encourage Z's motor development.
- Z continued to progress and one month later he was able to move into sitting and could attain a 4 point kneeling.
- Physiotherapy sessions included activities in standing.
- Z's foot position in standing was poor with instability at his ankles. He was seen by an orthotist who prescribed specialist footwear and FFOs.
- Physiotherapy sessions emphasised setting collaborative goals and teaching and advising family on which activities they could assist, in order to help Z achieve these goals. The time between sessions was dependent on Z's progress as well as his and his parents' needs. Sessions ran at home or in a Health Centre.
- Regular Family Service Plan meetings arranged and chaired by the key worker.

Nursery education

- By 2½ years discussion on nursery placement had begun and physiotherapy advice was submitted to the local authority for Z's Educational Statement as per the Education Code of Practice.
- At 3 years Z attended nursery 5 mornings a week and was fully supported by a 1 : 1 Learning Support Assistant.
- Key worker responsibilities transferred to the SENCO (Special Educational Needs Coordinator) at the nursery.
- Physiotherapy treatment sessions continued in the nursery during term time, and principles were continued on a daily basis by the LSA.
- The sessions included specific exercises and activities, e.g. exploring the outdoor equipment.
- Advice was also given regarding specialist equipment.

Outcomes

- At 3½ Z began to take independent steps.

- Poor foot position made him unstable and he lacked confidence to step.
- AFOs were discounted due to the potential for pressure areas.
- Z was referred to a tertiary centre for assessment for Botulinum toxin injections into his gastrocnemius and tibialis posterior muscles and following this he was able to tolerate bilateral AFOs and the range of dorsiflexion improved.
- His mobility improved and he was able to walk independently around nursery.
- His parents visited SEN and mainstream schools to decide which will meet Z's needs. Physiotherapy advice was provided throughout this process.
- At 5 years Z started at a mainstream primary school, with an LSA allocated to him for 20 hours.
- He continues to progress in all areas; walking around school independently. Although he remains unsteady he can jump and is beginning to run.
- Diagnosis remains uncertain.
- Z continues to be seen by a physiotherapist, speech therapist and occupational therapist.

Case Study 5.3

Background

- Sam is 8 years old.
- He is an only child and lives with his mother.

HPC

Sam has long-standing problems:

- He finds it difficult to make friends and often plays alone.
- He lacks confidence and has low self esteem.
- He cannot stay still and is constantly on the move and restless.
- He dislikes loud noises and often covers his ears with his hands.
- He dislikes the labels in clothes and his mother has to cut them all out.
- He hates having his hair cut.
- He continues to have difficulty with buttons and zips.
- He cannot ride a bike without stabilisers and avoids playing football or most other sport.
- He is a messy eater and is always knocking over his drink.
- He often has bruises on his shins and knees from knocking into things and falls.
- He complains of being tired but has trouble falling asleep.

School

- Sam attends mainstream primary school.
- He is a loner and does not join in the playground games.
- His teacher is concerned about the quality of his writing and lack of focus.
- He hates PE and is always the last one to change into his PE kit.
- He is poor at ball games.
- His teacher discusses her concerns with Sam's mother and requests an assessment by the educational psychologist.
- Sam is placed on the School Action Plus stage of the Special Educational Needs process by the school Special Educational Needs Coordinator (SENCO) and he is given extra help at school.
- The class teaching assistant (TA) is allocated time with him.

Assessment

- Sam's mother took him to see their GP who referred him to a paediatrician.
- The paediatrican excluded other conditions and diagnosed developmental co-ordination disorder (DCD).
- The paediatrican referred Sam to the joint physiotherapy and occupational therapy (OT) service for children with DCD.
- Sam's mother and school are asked to complete questionnaires to identify his main problems and strengths to make it possible to determine which services should see him for the initial assessment.
- It is decided that he should be offered an appointment with both a physiotherapist and occupational therapist. This way repetition of both the subjective and objective part of the assessment can be avoided and Sam only needs to attend one appointment.
- After discussion with his mother, Sam is offered an appointment first thing in the morning so that he missed as little school as possible but is not too tired.
- The assessment is carried out in the local community hospital where the room is spacious, child-orientated and close to home.
- The time is used efficiently; during part of the assessment one of the therapists will be working with Sam while the other is talking to his mother. One therapist will ask Sam to perform certain tasks whilst the other writes down specific observations.
- The subjective history is taken from Sam as well as his mother including asking how he feels and what his interests, likes and dislikes are.
- Both standardised and non-standardised assessments are used including the Movement ABC, clinical observations and physical examination of his tone, strength and joint range.
- After the appointment the OT and physiotherapist score the ABC, compile a report including his strengths, weaknesses, recommendations, etc.
- Sam's problems are identified and include motor planning, sensory processing, hip and shoulder stability and eye–hand coordination.
- The physiotherapist also visits Sam at school to speak to school staff more about their

concerns and to observe Sam in a PE lesson.

Recommendations/outcome

- The assessment findings are explained to Sam's mother and school.
- A detailed written report is provided including recommendations, strategies, and advice for both home and school.
- Sam is offered an intensive exercise programme at the community hospital. He attends once a week for 6 weeks and works with 3 other children on activities complied by the OT and physiotherapist to address his problems.
- The group starts at 4 pm allowing him to attend after school and lasts one hour.
- The children are asked to participate in planning activities to do each week.
- At the group he works on improving his gross motor coordination.
- He has exercises to practice at home in between group sessions.
- Sam's mother is invited to a parent workshop to explain and discuss DCD.
- School are invited to a DCD workshop as they are keen to run small group activities for several children and welcome strategies that can be effective in a classroom.
- School purchase a few small items of equipment to help improve his posture and position while he works.
- Following the conclusion of the group Sam is given a certificate for all his hard work – he takes it in to school and he is congratulated in assembly by the whole school.
- Sam is given information about local sports groups that will continue to enable him to generalise the progress he has made in an enjoyable and sociable setting. Sam chooses the one he wants.
- School continue with the strategies that help Sam and set an appropriate individual educational plan (IEP) that is reviewed termly.

Chapter 5 Community paediatrics multiple choice questions

1. Which of the following is a measurement of hip subluxation/dislocation?
   a). Cobb angle
   b). Migration percentage
   c). Acetabular angle
   d). Migration angle
2. Which of the following would not be appropriate for treating a child with spastic quadriplegia?
   a). 24-hour postural management
   b). Constraint-induced movement therapy
   c). Hippotherapy
   d). Aquatherapy
3. How long did Tardieu et al suggest that soleus must be stretched each day to prevent contracture (Tardieu et al 1988)?

a). 20 minutes
b). 1–2 hours
c). 4–6 hours
d). 6 hours plus

4. Which of the following are considered as a child's rights by the United Nations?
   i. The right to play and rest
   ii The right to special education and care if they have a disability and to live a full life
   iii The right to give your opinion, and for adults to listen and take it seriously
   iv The right to privacy
      a). all of the above
      b). ii and iii
      c). ii, iii and iv
      d). i, ii and iii
5. How long does the chemical effect of intramuscular botulinum toxin last?
   a). 1 week
   b). 1–2 months
   c). 2–4 months
   d). 6 months
6. Specialist footwear may be useful for a young child presenting with:
   a). Spasticity in their calf muscles and a passive range of –5° dorsiflexion with knee extension
   b). Ankle instability in standing and delayed walking
   c). Pronation of their feet in standing
   d). In-toeing during gait
7. During assessment it is important to ask about achievement of normal developmental milestones because
   a). Missing out a stage of normal development, such as crawling, can influence the child's gross motor ability
   b). It will explain how much the child was stimulated whilst he/she was young
   c). If the child did not achieve a specific stage, e.g. crawling, then that is the activity that should be worked on during physiotherapy sessions
   d). The parents will feel that the assessment is thorough
8. In normal development an infant is most likely to achieve independent sitting at approximately
   a). 4 months
   b). 6 months
   c). 10 months
   d). 12 months
9. A newborn full-term baby will adopt the following posture when laid in prone
   a). Takes weight through forearms and lifts its head up
   b). Head to one side and legs extended
   c). Head to one side and knees under abdomen

d). Lies with only abdomen on floor with limbs and head extended

10. By the age of 3, in normal development, a child should be able to
    a). Hop
    b). Ride a two-wheeled bicycle
    c). Walk up and down stairs independently, one foot per stair
    d). Run and kick a ball
11. Children with Duchenne muscular dystrophy are likely to develop contractures in which of the following:
    a). Shoulder flexors and hip flexors
    b). Knee extensors and elbow flexors
    c). Ankle plantar flexors and hip flexors
    d). Hip flexors and knee flexors
12. Which of the following is most likely to lead to delayed development in a child?
    a). Poor vocalisation
    b). Severe hypertonia
    c). Profound blindness or deafness
    d). All of the above
13. Which of the following is unlikely to reduce the risk of injury to the therapist when they treat a child?
    a). A variable height plinth
    b). Kneeling down to treat a child
    c). Using a wheeled stool
    d). Having someone assist the application of treatment
14. Which of the following would not be applicable during the assessment of a child?
    a). Any complications during pregnancy
    b). Apgar score at birth
    c). Identifying the parent's main concerns
    d). Score from SF-36
15. Which of the following are signs of underlying respiratory issues?
    a). Child is irritable
    b). Lip colour
    c). Flaring nostrils
    d). All of the above
16. Which of the following represents the normal heart beat for a child aged between 1 and 2
    a). 60–100 per minute
    b). 100–200 per minute
    c). 100–150 per minute
    d). 70–100 per minute
17. How many respiratory cycles would you expect a child aged 5–12 years to complete in a minute?
    a). 12

b). 30–40
c). 20–25
d). 25–35

18. Which of the following should be of immediate concern to a physiotherapist?
    a). Wheezing
    b). Productive cough
    c). Child failing to answer questions
    d). Grunting
19. A statement of special educational needs outlines which of the following
    a). The programme of physiotherapy that the child will receive
    b). The level of support a child requires at school to reach their potential
    c). The risk assessments associated with the clinical management of a child in their school
    d). All of the above
20. Which of the following is not a developmental milestone that is regularly assessed?
    a). Smiling
    b). Crawling
    c). Blowing out candles on a birthday cake
    d). Standing

Community paediatrics multiple choice answers

1. b)
2. b)
3. d)
4. a)
5. c)
6. b)
7. a)
8. b)
9. c)
10. d)
11. c)
12. d)
13. b)
14. d)
15. d)
16. c)
17. c)
18. d)
19. b)
20. c)

Reference

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Chapter 6

Community Physiotherapy

Introduction

- Community physiotherapy can be offered to people who are likely to benefit most from treatment in their own environment.
- Those who are housebound or have a long-term condition are examples of where this may be more appropriate than seeing them in a formal setting.
- A community physiotherapist can work in many different capacities, as a single-handed domiciliary physiotherapist, part of a multidisciplinary multiagency intermediate care team (ICT) or in one of the many other community teams.
- The assessment can take place in a variety of settings, from privately owned housing, rented accommodation, Council or Housing Association accommodation, supported housing (sheltered or special sheltered), a caravan, hostel, residential/nursing home or a day centre.
- Careful consideration must be given to the patient's choice (DOH 2001a), culture (CRE 2002), privacy, dignity and confidentiality (DOH 2003) (this includes never leaving messages on an answer-phone without the patient's permission).
- To ensure a safe interaction for the patient and physiotherapist a risk assessment needs to be carried out to cover the physiotherapist entering a person's home environment alone, with the difficulties this brings in terms of the potential for providing treatment in the space available (CSP 1998, 2002, 2009a,b).
- The environmental constraints where treatments take place could include the room being confined by furniture and general clutter such as piles of old newspapers or magazines. The room may be generally unkempt or even unclean and may be completely unsuitable for hospital equipment that requires space and a smooth clear floor to operate safely.
- Community physiotherapy is a speciality which requires 'core' physiotherapy assessment and treatment skills, with the additional focus on home-based functional goals.
- The functional goals are related to the patient's specific needs and their environment. If appropriate this can involve family members or carers to ensure that as much information as possible is obtained in order that the intervention will provide maximum benefit for the patient.
- Some physiotherapists find adjusting to this non-traditional approach frustrating or difficult, as there can be a considerable reduction in the time that they are able to use their 'pure' physiotherapy skills. The different working practice involves the development of new skills in holistic assessment, a more functional approach to treatment, the ability to set goals with the patient, that may be biased towards the

patient's needs rather than the desired physiotherapy outcomes. The role may even involve the physiotherapist being an advocate for the patient.

- Where consent is required for involvement with carers, either formal (through an agency) or informal (family or friends) this must be clarified as part of the assessment process (CSP 2004, DOH, 2001b,c,d).
- When visiting the patient in their home environment the physiotherapist may encounter issues around the patient being a vulnerable adult and these issues need to be identified and addressed appropriately (DOH, 2001a). Potential protection of vulnerable adults and safeguarding issues need to be identified and addressed appropriately (DOH 2006, ISA 2010). There are many types of abuse that may be encountered in the community setting, for example; neglect, physical, emotional, psychological and financial abuse (DCA 2005).
- A thorough assessment may need to take place over several visits; this will depend on the patient's ability to engage in the process. The limitations could be due to concentration span, exercise tolerance, mental state or other factors.
- Some community therapy teams may only be able to offer a brief intervention, consisting of assessment and advice. This will involve the physiotherapist undertaking a more specific, but superficial assessment to determine a patient's problems.
- If more complex issues are identified and a comprehensive assessment is required, this may need to be discussed within the team resulting in a request for a further referral or intervention by another team with a particular expertise.
- It is helpful for the physiotherapist to have an understanding of how teams in the community may differ in their roles. Social services teams will need to follow their directive regarding the types of issues they can deal with. If a patient has substantive needs then this becomes a priority for the service. Decisions need to be made about the referral of a patient with moderate needs and whether they will be able to access the service.
- It is important to be aware of other services that are available in the local area, statutory, voluntary organisations, charities and self-help groups (Appendix 6.1).

Referrals

- Depending on the criteria for each particular service, the referral could originate from any of the following: primary, secondary or tertiary care, social services, the voluntary sector or in some instances self-referral. With this in mind it is essential that the reason for referral is clear, realistic and has been agreed with the patient.
- In addition to the required standard data the referral form should include information about the social history of the patient, access to the property and any known risks to staff.
- To supplement the referral information the GP can supply other medical records (hard copy or electronic), which can include medical history, details of next of kin, name of

preferred contact, current medication as well as any previous interventions or other referrals.

- For patients referred following an acute episode of care in hospital, for example, following surgery or a fracture fixation, it is essential to confirm relevant dates for fracture healing times, or precautions following joint replacement surgery.

Knowledge for the community

Patient choice

- Many patients choose to request physiotherapy, but referrals made solely to satisfy the patient (or their carers), when the proposed goals are not realistic, can be frustrating for both sides. On occasions a referral can give the patient a false expectation of the potential benefits that can be gained from physiotherapy intervention.
- Some patients will have been seen previously by other services, including community physiotherapy and it is important to be aware of previous treatment approaches and the outcome of these as it may be possible to use the information as a basis for deciding the best intervention for the patient's current episode.
- Some patients may chose not to engage with the intervention and this must be respected, documented and reported back to the referrer.
- If, on assessment, it becomes apparent that the patient is not willing to continue with the proposed intervention, e.g. home exercise programme, then this decision must be explored further with the patient and the potential issues that may arise must be clearly outlined to them. The content of the discussion and the agreed outcomes must be documented.

Culture

- Develop an awareness of cultural requirements of patients to ensure the treatment is appropriate to their lifestyle.
- The choice of the individual to carry out a task in a specific way that might not be in accordance with the therapy plan must be acknowledged.
- Do not make assumptions, ask the patient about their preference for treatment that is appropriate to their culture and lifestyle. For example, if there is need to wash under running water it is inappropriate to set the goal for strip-washing at a basin. If it is not culturally acceptable to access the kitchen, then this needs to be taken into account when planning treatment interventions.

Confidentiality

- It is not appropriate to leave a message on an answerphone when attempting to make a first appointment to visit a patient.
- During the assessment confirm with the patient that it is acceptable or practical to leave messages on an answerphone or mobile phone. In addition clarify if a third party is involved in listening to messages, such as a family member, neighbour or warden.
- Privacy must be respected. As a community physiotherapist you will be working as a guest in someone's home and as such you must respect their wish for privacy and lifestyle choices.
- It is necessary to explain to the patient what the assessment process will involve and if the patient wishes to have others present, either their family or friend or another member of staff during the consultation then this wish must be respected.
- Just as you would close curtains around a patient's bed on the ward or in the department for privacy, remember bedrooms and living rooms may be overlooked by other houses or even be on a bus route, where passengers may be able to see into the accommodation.
- Respect a patient's dignity at all times. A patient may feel more relaxed in their own surroundings, but may need more time to complete tasks. A physiotherapist should be conscious of not rushing a patient, to maintain the dignity of the patient an assessment may need to be spread over several sessions.
- Others present during assessment and subsequent treatment should only be there with the consent of the patient.

Risk assessment

- It is essential that there are effective risk management procedures in place to ensure that personal safety, lone working, moving and handling, environmental and other risks are assessed and appropriate action plans identified.
- Therapists should ensure that they are familiar with and adhere to local policies and procedures (CSP 1998, 2002, 2009a,b).

Lone working and personal safety

- Often staff will be working alone for at least part of the day.
- If there are electronic community records it is important that these are accessed to establish if there are any noted concerns regarding the patient before the initial visit.
- If possible, telephone the patient prior to visiting to confirm the address, any parking restrictions, access to the property and whether the patient will be alone or have family or friends present.

Moving and handling

- Statutory training provided annually by employers or universities covers the basic legal requirements for you to ensure your safety and that of the patient.

- Equipment is available and must be used if indicated as a result of the risk assessment.
- Techniques used by the family and/or patient must be reviewed and if unsafe or inappropriate techniques are being used these must be addressed and safer alternatives agreed and documented. If agreement cannot be reached with the patient and/or carers, then it is essential to record this.
- A physiotherapist must never put themselves at risk of injury or harm.

Environment

- Points to consider:
  - Is the property in a high-risk area?
  - Is there safe parking nearby?
  - Is there safe access to the property (communal entrances/uneven paths)?
  - Is the property self-contained or communal living (hostel or B&B)?
  - Is there an entry phone, key-safe or on-site warden?
  - Is the patient safe to open the door independently or does the patient live alone or with family?
  - Are there pets or vermin, that could pose a risk?
  - Is there adequate heating, lighting and ventilation?
  - Is the environment cluttered or dirty?
  - Are there continence issues, which could result in a wet floor or bed?
  - Are there trip hazards, rugs/mats/loose flooring/cables?
  - Are there any moving and handling risks, e.g. the height of bed, chair/ toilet?
  - Is the environment suitable for equipment, if necessary?
  - How is equipment delivered in your area?

Important safety considerations

- Always check the reliability of information as far as possible.
- Do not visit a patient alone if you have any underlying anxiety or concern.
- End an intervention immediately, if you feel threatened.
- Have a planned exit strategy ready should you need it.
- It is not recommended to assess a new patient at the end of the working day. It is advisable to do these new assessments during the working day when colleagues are aware of your whereabouts and the unknown environment and patient can be managed with minimal risk.
- Ensure parking area is well lit and avoid isolated underground parking whenever possible (Figure 6.1).

Figure 6.1 Awareness of the safety of parking in isolated areas.

Assessment process

- In many communities the single assessment process is used as a joint Health and Social Services assessment tool, which can be supplemented with multidisciplinary and specialist physiotherapy assessments.
- When the assessment is complete it will be a 'snap-shot' in time and it is essential in community work to contextualise this information.
- Focus on the reason for referral, including any long-term issues and functional limitations and how these are currently being managed is essential before identifying how the new issues can be addressed.

Consent

- Consent to share any information must be obtained from the patient at assessment. Patient-held notes in the community are a useful resource, but the wishes of the patient as to whom has access to these must be respected (CSP 2004, DOH, 2001b,c,d).
- Communication will be more difficult with patients who do not have English as a first language. Translation services should be available, but it may not be possible to access this service for some dialects. Local policies recommend that family members or friends are not used and that trained translators should be used for confidentiality, accuracy and maintenance of the patient's dignity.
- Contact details and written information/advice should be left with the patient in a place agreed by them to ensure confidentiality.
- Patients with any communication problems, e.g. sensory impairment, low literacy skills or other challenges need to be managed in an appropriate way.
- Once communication channels and previous interventions have been established, relevant subjective information for the intervention needs to be gathered.

Subjective assessment

- As with any physiotherapy intervention, consent is legally required prior to each part of the assessment and subsequent sharing of information.
- Most physiotherapy assessments carried out in the community follow the biopsychosocial model.

Medical history

- Demographic information, past and current medical history as well as medication information is readily available and will have been recorded in the records of the patient held by Health and Social Services.
- Community physiotherapists have the opportunity and responsibility to obtain the maximum amount of relevant information to influence assessment, goal setting and subsequent treatment.
- Time restrictions may have prevented previous professionals from gaining 'in-depth' and sometimes personal information, which may impact on the management of the patient.
- The community physiotherapist should be able to give the patient the time to focus on and explore aspects of their physical and mental well-being to enable an effective assessment to be completed.
- Effective assessment helps to establish an effective treatment plan and therefore leads to improvements in the quality of life of the patient.

Drug history

- All patients should have a regular medication review, during the assessment check that the patient is taking their medication according to the instructions and report any deviation from the plan to the GP.
- Polypharmacy can be confusing, so compliance aids, e.g. blister packs or the use of a dossette box may be appropriate if it has been identified that the medication regimen is not being managed safely (Figure 6.2).
- It is essential to check that patients can access their medication, either from conventional bottles or the compliance aid.
- Check local policies to see if formal carers are trained to administer medication from specific containers (bottles or compliance aids).

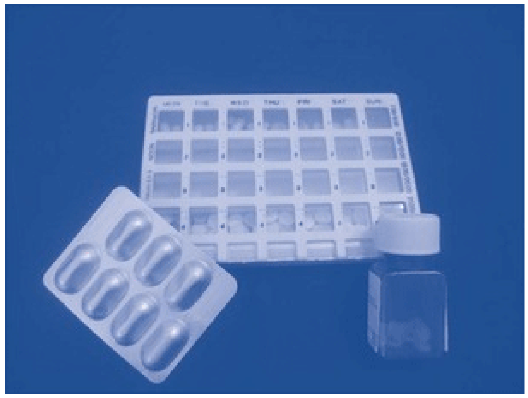

Figure 6.2 Compliance aids, Dossette box.

Pain

- Using core assessment skills will reveal if pain is impacting on functional activities of daily living.
- Management of pain is closely linked with the medication regimen, so consider the 24-hour pain cycle. Having the morning dose of analgesia by the bedside ready for the morning can impact greatly on a patient's ability to undertake the first tasks of the day.
- As with other medication it is important that these are taken regularly and the maximum dose is not exceeded in any 24-hour period.

Range of movement and muscle strength

- Core assessment skills will be used, but may need to be adapted for use in the community setting. Often working with a client group with long-term conditions and/or chronic reduced levels of function make it difficult to improve functional ability with an exercise programme.
- Having the time to discuss the impact of these limitations and restrictions on their preferred activity level should guide, inform and influence goal setting, e.g. patients in single-level living accommodation will still need to do steps in order to access amenities in other locations.
- If the patient agrees there may need to be simple environmental adaptations, such as adapting the height of a chair, bed or toilet seat and ensuring items in the kitchen are within reach.
- Remember that there is now increasing availability of simple equipment in high street stores. If a referral onto statutory services is not appropriate or wanted by the patient, then advice regarding suitability of privately purchased equipment can be given after the assessment has been completed.

Decreased exercise tolerance (respiratory or cardiac impairment)

- Patients may describe feeling frail and having less energy.
- This gradual deconditioning may be improved with a progressive exercise programme.
- If this is not appropriate, or the patient does not choose to participate, referral to Occupational Therapy should be considered for energy conservation techniques or provision of equipment, e.g. placing a stool or chair in the bathroom or kitchen which may facilitate independence.

Mobility

- Patients should be given time to express concerns about the impact of any decrease in their mobility that has affected their lifestyle.
- Assessment needs to identify if the patient is safe to access all areas of their home environment or if there needs to be an alteration to single-level living or even the setting up of a microenvironment (where the patient is able to access all facilities in one room).
- Previous equipment provision and advice needs to be reviewed. There may be a change in the patient's condition and therefore the previously supplied walking aids may need to be replaced.
- Patients with less than substantial needs may need to be advised to purchase mobility aids privately.
- After an acute event, e.g. fall or fracture, timely and specific assessment is essential for reducing the risk of further falls and increasing confidence in mobility and improving their quality of life and psychological state (DOH, 2001a).
- When gathering information on their falls history, the community physiotherapist will be in the ideal situation to assess the home environment for potential hazards.
- High-level function related to outdoor mobility and the use of public and private transport can be considered for inclusion in the rehabilitation plan and in goals set with the patient (Figure 6.3).
- Podiatry referral and footwear reviews need to be considered.

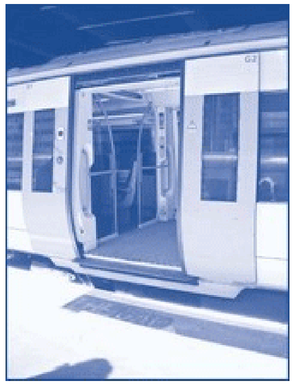

Figure 6.3 High-level outdoor mobility assessment includes use of public transport.

Mental health issues

- Assessing patients in their own home can be challenging, as establishing a willingness to engage with a physiotherapist may be difficult, due to levels of anxiety or withdrawal.
- If the patient prefers and consents to a familiar person being involved in the assessment process (family, friend, warden, community psychiatric nurse (CPN)) then this may be appropriate.
- Anxiety, depression and dementia all impact on the potential for improvement. The patient may be unable to be proactive in a rehabilitation programme, therefore a more slow-stream approach may need to be offered.
- Patients with chronic cognitive impairment are likely to have limited ability to engage with the rehabilitation programme and medication management; therefore this will need to be taken into account when planning treatment.
- It is essential that there is differentiation of the patient's presentation, for example an acute confusion can be associated with an infection that is treatable (e.g. urinary tract infection).
- Ideally there are effective support networks for patients that can be involved in the implementation of the treatment plan, e.g. community psychiatric nurses, befriending services or clubs (OPG 2005) (Appendix 6.1).

Reasoning relating to the objective testing for personal and domestic activities of daily living (ADL)

- The functional approach, using the biopsychosocial model is essential when assessing patients in the community.
- Pain, reduced range of movement and/or muscle strength, mobility problems, decreased

exercise tolerance due to respiratory and/or cardiac limitations, and mental health issues will become apparent.

How a patient manages their routine can form part of the baseline assessment

- Examples of how patients organise their routines are:
  - Do they use all of their accommodation or do they live in a microenvironment?
  - Do they sleep in a bed, a recliner chair or the sofa?
  - Are they restricted in moving from lying to sitting to standing?
  - Can they access the toilet/commode and manage toileting independently?
  - Can they wash and dress themselves?
  - Can they prepare hot drinks, light snacks or manage full meal preparation?
- There may already be a package of care in situ to support these tasks, but it is worth considering if improvements can be made.
- Advice/re-education or provision of equipment may be appropriate, if acceptable to the patient. Remember to establish if the person wants to or needs to do the task.
- Patient safety is fundamental and if the patient is not safe with some activities then it is essential that alternatives are found.
- Tele-care systems can reduce risk of problems occurring, with sensors detecting movement from a chair, bed or general activities, such as leaving the bath running or cooker turned on.

Outcome measures

- All outcome measures need to be carefully documented for consistency.
- Whilst some are validated for use in the community others can and need to be adapted, e.g. the 'Timed up and go' test (TUAG) from the armchair to the front door (Mathias et al 1986).
- Others may be inappropriate due to the limitations in the community setting with space, safety and time, e.g. shuttle walking test (Tobin et al 1999).

Treatment planning

- Patients are more likely to engage in a treatment programme if there is an obvious benefit to their quality of life, e.g. being able to toilet themselves or make a hot drink.
- In some areas the community occupational therapists offer a 'trusted assessors' course which will provide skills for other professionals to carry out an assessment for basic environmental adaptations, such as simple grab rails, stair rails and chair raises, so that these can be ordered as part of your intervention.
- Environmental changes or adaptations can be offered to improve independence and

safety; however, lifestyle choices have to be respected. The patient may wish to live in a cluttered or dirty home. If this has potential to impact on the safety of staff then the physiotherapist has the right to refuse to enter the property. If it is acceptable to the patient, a 'blitz' clean can be offered through the local council, after which health and social care workers may agree to enter the property to carry out the necessary assessments and treatments.

- Documentation of such issues is essential and will ensure that at a later date the initial findings and advice offered can be confirmed (CSP 2000).

Goal setting and carers

- It is always important to have an indication from the patient of their expectations of treatment.
- This can be achieved through joint goal setting and it is essential that these are negotiated with the patient for realistic treatment plans to be achievable.
- In a community setting this may also involve carers, as the treatment will be carried out within the patient's home environment.
- Consideration needs to be given to:
    - The activities are carried out by the carers and why.
    - Whether the patient has the ability or desire to take over these tasks.
    - Whether the carer/s want this to happen.
    - Whether it is appropriate for the carers to be included in the treatment planning.
    - Whether the carer/s want this to happen.
- The intensity of the input may affect treatment planning, if the activities need to be supervised to ensure patient safety.
- A domiciliary physiotherapist able to visit once a week will need to plan a different intervention compared to a physiotherapist in an intermediate care team who can arrange for support workers to visit up to three times daily.
- Consideration as to whether the patient needs to be managed in a lesser or greater intensity of service should be part of the assessment process.

Summary

- This chapter has illustrated how core physiotherapy skills need to be adapted to the community setting.
- The way in which the community physiotherapy service is funded and managed will influence service availability and delivery in different locations.
- However assessment and subsequent treatment should always remain functional, goal-focused and appropriate to the patient and their home environment.

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Product Information leaflets and guidance documents, e.g. AGILE handbook of Functional Assessment Tools in Rehabilitation

Chapter 6

E-materials

Author profiles

Karen Rix GradDipPhys MCSP

Karen Rix is a Clinical Specialist Physiotherapist working in Croydon Community Health Services as Clinical Team Leader.

Karen has worked in the Community since 1982, 8 years of which have been in Intermediate Care gaining extensive experience of working in different community teams.

She is currently Chair of the Association of Chartered Physiotherapists in the Community and editor of Out & About, their quarterly Newsletter.

Maureen Carter

Maureen has a wealth of experience gained from working in the NHS and overseas in a variety of clinical specialities.

Since 1986 Maureen has worked in the Community setting, first in a domiciliary team and in the latter part of her career as part of an Intermediate Care team.

In addition to her clinical experience Maureen has worked extensively as a clinical educator providing support for students during placements in the primary care environment.

Maureen has held regional and national posts with AGILE and the ACPC.

Maureen retired officially in 2009, but as with contributing to this book she admits to being 'tempted back from time to time!'

Yvonne Wren GradDipPhys

Yvonne Wren retired from the NHS in 2008 after working as a physiotherapist for 35 years in south-east London. Initially specialising in stroke rehabilitation, the last 20 years she has worked in elder rehabilitation and in the community. Her last post was as the clinical therapy lead for intermediate care in Southwark, working within integrated services.

As an experienced clinical educator, Yvonne was approached by the link tutor at the University of East London and asked to become a specialist lecturer there for the community module of the physiotherapy degree course. In this role, she gave lectures and facilitated seminars at the university for the five years before she retired.

Appendix 6.1 Community resource file

Policies and procedures

The method of accessing these should be clearly identified on induction to the department.

The Community Therapy team should have easy access to local policies and procedures, either in electronic format via the intranet or as hard copy in folders (these must be regularly updated).

Up-to-date national guidelines and policies should also be available to staff and if access via a ‘search engine’ is not allowed then these should be available as hard copies in the department.

Sources of online guidelines and policies

www.csp.org.uk
www.dh.gov.uk
www.nice.org.uk/guidance

Local groups and services

This information is invaluable to the community physiotherapist and will have been collected by the team as a general resource. If not then maybe this can be a project for the next therapist on rotation or for a student's presentation.

Contact details for other community colleagues such as occupational therapists, podiatry, community dietetics, general community and specialist nursing teams, continence services, and community pharmacy services should be readily available.

The voluntary sector, charities and self-help groups are all essential for patients with long-term conditions to be managed effectively.

Online resources voluntary sector and self-help groups

www.nhs.uk/conditions
www.patient.co.uk
www.netdoctor.co.uk
www.ageuk.org.uk
www.carers.org
www.self-help.org.uk
www.charitiesdirectory.com

Assessment forms, outcome measures and exercise sheets

General and specialist assessment forms, a selection of appropriate outcome measures and a selection of printed exercise sheets are essential to standardise interventions between therapists. Leaving written information with the patient maximises the benefit of the intervention.

Specific treatment protocols requested by a referring consultant should be available for routine referrals or obtained individually if necessary.

It is essential that a physiotherapist is aware of these before visiting a patient.

Equipment

A community physiotherapist should have a panic alarm and mobile phone with preprogrammed essential contact numbers with them at all times.

It is also essential to be aware of any phone network black spots in their area.

Equipment such as walking frames should be delivered by the local equipment service, but small items such as crutches and walking sticks can safely be carried in the boot of a car.

Also helpful to be kept in the car is a small supply of different size ferrules, a tape measure, hacksaw and a spanner.

A torch and satellite navigation system, or at least a street map are also essential.

Other essential equipment such as a stethoscope, goniometer, tape measure and resuscitation mask need to be carried in an appropriate lockable bag that can be easily carried. The bag will also be needed for safe transportation of the patient notes, work diary and spare paperwork.

A copy of the BNF (British National Formulary) can be useful to identify medication during patient assessment.

Infection control equipment

Gloves, aprons, hand wash and paper towels, hand gel and protective goggles should be carried in the car.

Case Study 6.1

80-year-old lady (Mrs A) – fall in nursing home

Assessment begins on receipt of the referral from GP stating Mrs A fell 4 weeks ago, sustaining soft tissue injury around the right knee, but no fracture.

Past medical history

- Left hemiarthroplasty 2 years ago.
- Osteoarthritis in knee joints managed with analgesics.
- Congestive cardiac failure controlled by diuretics.
- Type II diabetes controlled by tablets.
- Difficulty mobilising independently and safely.

Social history

- Resident in a nursing home for past 6 months after having increasing difficulty coping at home.
- History of self-neglect.
- Recurrent urinary tract infections.
- Confusion.
- Frequent falls.
- Mobile with a frame and assistance/verbal prompting.

Subjective assessment

- Patient remembered tripping over her slippers when trying to reach her clothes.
- No apparent injury at the time.
- Right knee feels stiffer and more painful to walk on the next day.

Objective assessment (patient supine)

- Arthritic valgus deformity bilaterally in both knees.
- Right knee more swollen and tender.
- Pitting oedema bilaterally at ankles.
- Movement and muscle strength reduced in lower limb joints, particularly around right knee.
- Patient had difficulty rolling onto her side and sitting up in bed (staff always helped).
- Sitting balance good, dizzy initially.
- Needed assistance sit to stand, again felt dizzy, and needed frame for support in standing.
- Mobilised using the frame, with verbal prompting, to turn and sit safely.
- Became breathless after mobilising for 20 steps.

Outcome measure

Elderly Mobility Scale (Smith R 1994 Validation and reliability of the Elderly Mobility Scale. Physiotherapy 80:744–747).

Treatment plan

Assessment findings discussed and agreed with Mrs A.

The agreed goals were to:

1. Be able to walk without fear of falling
2. 'Get the knee moving again'
3. Be more independent.

It was discussed how this might be achieved, using SMART goals and involving the nursing home staff.

Plan

Problem 1 Reduced range of movement in right knee

- Teach patient and staff active knee flexion/extension exercises.
- Give staff written/diagrammatic instructions.
- Instruct staff how and when these exercises should be performed.

Problem 2 Reduced muscle strength in right knee

- Provide strengthening exercises for right knee.
- Give staff written/diagrammatic instructions.
- Instruct staff how and when these exercises should be performed.
- Teach correct technique for standing from sitting.
- Teach staff how to supervise safe standing technique.

Problem 3 Dizziness related to postural changes

- Staff to check lying/standing blood pressures until GP review.
- Staff to monitor blood glucose levels as agreed by diabetic nurse.
- Medication review by GP.
- Patient and staff advised on potential risk and not to carry out activities alone or too quickly.

Problem 4 Difficulty moving in bed

- Advise on methods of increasing bed mobility.
- Arrange for provision of bed lever.
- Decrease patient's level of dependence on nursing home staff.

Problem 5 Fear of falling

- Advise patient of causes and risks of falling and how to avoid them.
- Ensure appropriate footwear available.
- Discuss with patient how to be independent and safe.

Advise staff to

- Ensure patient's property, drinks and call bell are always within reach.

- Arrange an eye test if appropriate.
- Ensure regular podiatry visits take place.
- Ensure medication review takes place (Smith R 1994 Validation and reliability of the Elderly Mobility Scale. Physiotherapy 80:744–747).
- Make dietetic referral if necessary.
- Monitor condition and suitability of walking aid.

Intervention should be fully documented in physiotherapist's notes and patient record in the nursing home.

Contact information, return date and time to be left with patient and nurse in charge.

Case Study 6.2

76-year-old man (Mr B) – Parkinson's disease and UTI

Assessment begins on receipt of referral from GP stating Mr B had a UTI resulting in him 'going off his feet'.

Past medical history

- Parkinson's disease treated with dopamine.
- Hypertension controlled by betablockers.
- OA knees managed with analgesics.
- Constipation managed by regular laxatives.

Social history

- Lives with wife in three-bedroom house.
- Previously mobile indoors with no aid.
- No adaptations or equipment other than a second stair rail.
- Able to manage stairs.
- Toilet and bathroom upstairs also toilet on ground floor.
- Sleeps upstairs and wakes once or twice nightly to pass urine (keeps a urine bottle by bed).
- Usually independent with bed and chair transfers.
- Access involves a step front and rear.
- Sloping drive at the side of the house.
- Supervision/assistance outdoors.

- Assistance for car transfers.

Subjective assessment

- Lost confidence.
- Afraid of 'freezing' or knees giving way.
- Reluctant to get out of bed.
- Increased constipation from reduced mobility causing back pain and decreased appetite.
- Swallowing difficulties compromising his ability to eat, drink and take medication.
- Concerned with his high dependence on his wife.
- Concerned for his safety on the stairs.

Objective assessment (patient supine)

- Reduced active trunk movement due to rigidity and muscle weakness.
- Cog-wheeling in upper limbs.
- Tightness in elbow flexors.
- Fine resting tremor (pill rolling).
- Tight hamstrings, hip adductors and gastrocnemius/soleus.
- Required assistance for rolling, lying to sitting and sitting to standing.
- Flexed posture in lying, sitting and standing.
- Short shuffling steps with minimal trunk or arm movement.
- Unable to assess on stairs at initial visit.
- Difficulty accessing downstairs toilet.
- Anxiety around continence problems.
- Poor voice projection and difficulty clearing saliva.
- Functional ability and concentration varied with medication.

Outcome measures

- Timed unsupported steady stand.
- Elderly Mobility Scale.

Treatment plan

Assessment findings discussed and agreed with Mr B.

The agreed goals were to:

1. Use stairs again
2. Be less dependent on his wife

3. Be able to go out with his wife.

It was discussed how this might be achieved, using SMART goals and supported by his wife.

Plan

Problem 1 Reduced range of movement trunk and limbs

- Provide active exercises with written/diagrammatic instructions.
- Demonstrate these exercises and when they should be performed.
- Arrange for supervised sessions with support worker.

Problem 2 Difficulty with bed transfers and mobility

- Provision of equipment, e.g. walking and bed aids.
- Transfer practice with support worker.

Problem 3 Increased dependence on wife

- Advice to wife on offering appropriate level of support.
- Demonstrate how best to enable Mr B to carry out activities.
- Teach strategies to Mr B and wife to facilitate mobility.

Problem 4 Loss of confidence in ability to use stairs

- Assess on stairs and practise with support worker.
- Vary times of visits to assess how Mr B’s ability fluctuates.
- Progress to outdoor mobility as function improves.

Onward referrals

- OT.
- SALT.
- GP.
- Carers’ assessment.
- Benefits review.
- Local PD support group.
- Dietician.
- Podiatrist.

On discharge

- Review goals.
- Provide Mr B with maintenance regime.

Case Study 6.3

62-year-old lady (Mrs C) – COPD

- Assessment begins on receipt of referral to Intermediate Care from GP stating Mrs C has an infective exacerbation of her COPD.
- One week of treatment with antibiotics and steroids had not regained her previous level of function and she was unable to manage.
- She had been discharged 8 weeks previously and refused a further admission to hospital.

Past medical history

- COPD salbutamol nebuliser, Seretide inhaler, Spiriva inhaler.
- Osteoporosis with vertebral collapse Alendronate, Calcichew.

Social history

- Lives in first-floor private warden-controlled flat with lift.
- Widowed 5 years ago.
- Daughter lives 200 miles away.
- 20 pack year smoking history.
- Privately purchased 4-wheel walker with seat for indoor use.
- Wheelchair for social trips, etc.
- Prior to admission to hospital had been independent with PADLs, attended the lunch club, managed her own laundry and used the mini bus for shopping trips.
- On discharge from hospital had a twice daily care package for PADLs, a weekly housework and laundry call and lunch was sent up from the lunch club.

Subjective assessment

- Short of breath on exertion, cough producing thick green sputum.
- Low in mood and tired.
- Unable to tolerate sleeping in her bed, so using the recliner chair.

- Increased SOB had prevented her from participating with carer in her washing and dressing for the past week.
- Stress incontinence and frequency. Bowels not opened for 2 days.
- Loss of appetite, warden calling in to provide hot drinks and emotional support.

Objective assessment

- Using accessory muscles and pursed lip breathing.
- Unable to speak in complete sentences. O_2 sats 88% on air.
- Finger clubbing and ankle oedema.
- Mild kyphotic deformity with ↓ ROM in trunk and upper limbs.
- Unable to perform unsupported arm movements when asked to comb hair.
- Generally deconditioned, muscle wasting quads and gluts.

Outcome measures

- Modified Borg scale.
- Self efficacy scale.
- London chest ADL scale.

Treatment plan

Assessment findings discussed and agreed with Mrs C.

The agreed goals were to:

1. Learn coping strategies.
2. Return to sleeping in a bed.
3. Be independent of carers.
4. Be able to return to lunch club.
5. Resume weekly supermarket shopping trips.

Problem 1 Coping with long-term condition

- Effective use of inhalers.
- Emergency antibiotics/steroids for early treatment of exacerbations.
- Breathing control/relaxation techniques.
- Awareness of good nutritional balance/weight management.
- Continence advice.
- Maintenance of social and support network.
- Access to respiratory nurse (if appropriate).

Problem 2 Unable to sleep in bed

- Advice on positioning, pillows, etc.
- Commode for use by bed at night.
- Teach energy-saving techniques for getting in/out of bed.
- OT assessment for equipment.

Problem 3 Independent washing and dressing

- Advice on energy conservation techniques.
- Advice on supported arm function.
- Use of equipment, perching stool, long-handled washing and dressing aids, etc.

Problem 4 Unable to mobilise to lunch club

- Regime of progressive exercises to increase exercise tolerance.
- Use of seat on wheeled walker to rest at intervals.
- Advise on continence management.

Problem 5 Unable to do weekly shopping trip

- Increase exercise tolerance indoors.
- Practise supervised outdoor access.
- Practise steps and curbs.
- Practise accessing minibus.
- Advise on benefit of using supermarket trolley to reduce effort.

Onward referrals

- Respiratory nurse specialist.
- Pulmonary rehabilitation group/Respiratory support/Breathe Easy group.
- Dietician.
- Continence Service.
- Podiatrist.

Chapter 6 Community multiple choice questions

1. A new referral arrives in the office. Do you:
   a). Contact patient and referrer to acknowledge referral?
   b). Assess level of urgency and place referral on the pending list?
   c). Check referral for level of information and contact referrer if this is inadequate to prioritise?

d). Leave on desk to deal with later?

2. You are visiting a new patient. Do you:
   a). Contact patient to arrange appointment time, check details, location and means of access?
   b). Turn up without prior arrangement as you are in the area and have a "space"?
   c). Explain who you are and the nature of your service with information material?
   d). Show your identification to patient?
3. There is no free parking near the patient's home. Do you:
   a). Use parking permit as specified?
   b). Use metered parking with payment?
   c). Park on or across neighbour's driveway, leaving address details on dashboard?
   d). Abandon visit?
4. You are late finishing at the end of the day. Do you:
   a). Contact base to inform you have finished and be signed out?
   b). Contact colleague to confirm you have finished?
   c). Drive home as no one else will be working still?
   d). Ask patient to inform base that you have left if they call?
5. You have all the patient notes for your day's visits. Do you:
   a). Keep notes locked in boot?
   b). Keep them with you in a slip folder?
   c). Keep them with you in a locked briefcase?
   d). Leave them on the car seat?
6. Your patient has difficulty transferring and her husband is lifting her. Do you:
   a). Let him continue as this is their routine?
   b). Introduce hoist and carers?
   c). Assess how much the patient is able to do?
   d). Demonstrate an alternative and let patient and carer try for themselves?
7. You have assessed your patient's ability to answer questions and consider them able to provide valid information, but their relative/carer answers your questions for the patient. Do you:
   a). Let them continue as they know the situation?
   b). Explain to relative/carer that the initial information needs to come from the patient?
   c). Ask relative/carer to move to another room?
   d). With patient's consent corroborate information from relative/carer?
8. You feel it is essential your patient has further investigation/intervention. Do you:
   a). Refer on and inform patient once arranged?
   b). Discuss with patient explaining why you feel the referral is required, then refer on?
   c). Refer on without informing patient as they might refuse?
   d). Inform referrer and suspend treatment?
9. You are referred a patient with a history of alcohol abuse. Do you:
   a). Visit to assess the situation?

b). Check with GP/referrer how major an issue this is and potential risk?
c). Carry out a joint visit to assess if intervention is appropriate?
d). Decline to visit?

10. You visit a patient and they or a family member are verbally abusive. Do you:
    a). Continue the visit ignoring the abuse?
    b). Leave, giving the reason you will not tolerate such abuse?
    c). Leave on the pretext of getting something from the car?
    d). Try to reason with the patient/relative over a cup of tea?
11. Your team member reports a patient has been increasingly verbally abusive during a series of visits, but you have not experienced this. Do you:
    a). Confront patient?
    b). Discuss with colleague indications of what prompts this behaviour and how they present themselves to patient?
    c). Carry out joint visit, yourself leading?
    d). Carry out a joint visit, colleague leading?
12. You are treating a stroke patient who has a further CVA with marked deterioration making it inappropriate to continue with your original programme. The patient expects you to continue as before. Do you:
    a). Carry on in an attempt to regain ground?
    b). Delay further treatment until appropriate investigations have been undertaken?
    c). Reset appropriate goals with patient and others involved with their rehab?
    d). Refer on to other services to meet his level of need?
13. You visit a patient in a nursing home and find them on the floor. Do you:
    a). Help staff to hoist patient onto bed/chair?
    b). Get them up on your own as the patient does not want any fuss?
    c). Ascertain if patient is injured and request the staff call emergency services?
    d). Document event in your NHS notes, Nursing Home notes and complete incident forms?
14. Your patient had a fall on their son's stairs and is now nervous of her own stairs. She is sleeping in an armchair downstairs. Do you:
    a). Refer to falls service depending on outcome of assessment?
    b). Assess on stairs for rails or other adaptations?
    c). Practise stairs with therapist and support workers until confidence returns?
    d). Arrange for bed to be brought downstairs?
15. After assessment you feel a patient would benefit from a walking aid, which they decline. Do you:
    a). Refuse to continue, as patient is non-compliant?
    b). Explain the reasons for your advice, the benefits of using it and encourage the patient to try the aid?
    c). Insist on them using the aid?
    d). Document patient's refusal to use the aid despite your advice and highlight any associated risks?

16. Your patient expects to be mobile outdoors following a short intervention. Your assessment shows this is a longer-term goal. Do you:
    a). Not state this for fear of upsetting the patient and reducing benefits of intervention?
    b). State at outset why this would not be achievable?
    c). Discuss the issues and explain the need for short-term achievable goals?
    d). Discuss longer-term goals and how they might be addressed?
17. Your patient's relative/carer/neighbour asks about their condition and your intervention. Do you:
    a). Pass on information in private?
    b). Suggest they ask the patient?
    c). Clarify with the patient at outset what information they want shared and with whom?
    d). State you can give them no information without consent?
18. You are referred a patient with mobility problems and variable compliance due to dementia. Ongoing therapy is not practical as the patient cannot remember your visits or instructions. The family feel 'physio' will help. Do you:
    a). Offer advice re mobility management to carer?
    b). Explain you cannot treat without patient's consent?
    c). Discuss with referrer as treatment is inappropriate as patient is non-compliant and discharge?
    d). Refer to GP for referral for psychogeriatric assessment and to more appropriate services?
19. You have a Muslim patient who has had a left CVA resulting in a flaccid right upper limb. You believe religious convention prohibits using the left hand for eating. Do you:
    a). Expect him to carry out all activities left hand only?
    b). Expect family/carers to feed him?
    c). Ask OT to assess level of function with patient's consent?
    d). Clarify if he is prepared to use his left hand for feeding in view of his disability?
20. You have a patient who has fallen several times, been to A&E and is becoming increasingly frail. The family are adamant that the patient is unsafe being left alone and should be admitted to hospital or a nursing home for 24-hour care. Do you:
    a). Discover patient's wishes?
    b). Suggest the availability of private full-time care?
    c). Suggest family discuss concerns with patient as no decision re nursing or residential home can be made without their consent and hospital will not admit without medical need?
    d). Explain level of input available from social services in way of care package and other voluntary support, again would be at consent of patient?

Community multiple choice answers

1. c)

2. a)
3. a)
4. b)
5. c)
6. c)
7. b)
8. b)
9. b)
10. b)
11. d)
12. c)
13. a)
14. c)
15. d)
16. c)
17. c)
18. d)
19. d)
20. d)

Chapter 7

Gerontology

General principles

- Assessment should be based around the functional ability of the older person and their ability to maintain an independent lifestyle.
- Movement is context-dependent and therefore it is essential to understand the individual's physical and social circumstances and the external environment that indirectly affects the individual.
- Older people are more likely to have a long-term condition, and are also more likely to have impairments resulting from two or more concurrent conditions. The impact of multi-pathology must be taken into account during the assessment process.
- It is important for the physiotherapist to assess whether the presenting problem is due to age-related change, underlying impairments, deconditioning, deskilling or a combination of these. The physiotherapist should also assess the individual's values and beliefs about their health and identify any psychological barriers that may impact on rehabilitation.
- The physiotherapist should include specific assessment of the musculoskeletal, cardiorespiratory and neurological systems depending on the older person's presenting problems. The assessment process may need to accommodate for changes in the older person's ability to participate in a lengthy assessment.
- It may take a number of sessions to complete the assessment.
- Physiotherapy is often part of a multidisciplinary assessment of an older person.
- Teamwork is essential in order to build a comprehensive picture of the older person's abilities and establish an effective treatment plan.

Knowledge specific to gerontology

Systemic 'normal' age changes

- The development of age-related changes tends to follow a pattern that is unique to the individual.
- Normal biological ageing progressively lowers the amount of available reserve.
- The rate and extent of decline varies across physiological systems and individuals.
- Physiotherapists should expect greater variability among their older patients.

Central nervous system: special senses

Vision

- Visual acuity, accommodation and depth perception decline with age.
- Adaptation to darkness and light occurs more slowly.
- Contrast sensitivity decreases with ageing (Hampton et al 1997).

Practical points

- Check that glasses are clean and that the person is wearing the correct pair.
- Ensure that the treatment area is well lit.
- Exercise sheets and information leaflets should be large, bold type.
- Assess the person's ability to distinguish objects in his/her immediate environment.

Hearing and vestibular system

- Hearing loss especially at higher frequencies is common (Hampton et al 1997).
- The vestibular system shows progressive loss of hair cells, vestibular ganglion cells and nerve fibres which contribute to decline in the ability to detect orientation in space and uncertainty to move around in the dark (Ghosh 1985).

Practical points

- Even mild hearing loss makes understanding speech difficult, particularly when there is background noise or more than one person talking.
- Try to reduce background noise as much as possible.
- Face the person to facilitate lip reading.
- Check that hearing aids are switched on.
- If one ear is better, speak on that side.
- Don't shout as this distorts the speech sounds.
- Speak clearly, more slowly and at a slightly lower frequency.
- Sometimes it may be necessary to use written communication (carry some paper with you) or basic sign language.
- Be aware that an older person may come across as confused when in fact they have not heard the question or instruction.

Skin and somatosensory system

- Older people are less sensitive to:
  - Vibration especially in the lower limbs (Kenshalo 1986, Shaffer and Harrison 2007)
  - Touch pressure (Wickremaratchi et al 2006)
  - Two point discrimination (Shimokata and Kuzuya 1995)

- Cutaneous pain (Lautenbacher et al 2005)
- Smell and taste (Boyce and Shone 2006).

- These changes are due to a reduction in the number and structure of specialised nerve-ending receptors and peripheral nerve degeneration.
- Thinning of the subcutaneous tissue leads to wrinkling of the skin. The skin capillaries bleed more easily.

Practical points

- Care should be taken when handling and positioning the older person if they have thin, delicate skin.
- Watch for sensitivity to interventions, e.g. ice, massage.

Central nervous system: brain and spinal cord

- Ageing is associated with:
  - A slow accelerating reduction in brain size with a 10% or greater loss in total brain weight over a normal long life. Both grey and white matter is lost, the former to a greater degree.
  - Shrinking of the branches of the dendritic arbour.
  - Reductions in the enzymes that help produce neurotransmitters.
  - An accumulation of lipofuscin, neurofibrillary tangles and plaques in neurones but not to such a degree as in dementia (Hampton et al 1997).
  - A small decline in maximal nerve conduction velocity (Rivner et al 2001).

Practical points

- The ability to remember new memories of events or facts, working memory and episodic memory declines in normal ageing (Hedden and Gabrieli, 2004).
- The physiotherapist should supplement instructions with an exercise sheet or visual prompts and instructions.
- The number of exercises may have to be limited and more time given to learn them.
- Changes in nerve conduction velocity do not impact on function.

Muscles

- Ageing is associated with:
  - Loss of muscle mass and a corresponding reduction in maximal muscle strength (Skelton and Beyer 2003, Deschenes 2004).
  - Not all muscle groups atrophy at the same rate with weight-bearing muscles

showing the most change.
  - Loss of motor units and a decreased number of Type II muscle fibres (Proctor et al 1995).
  - Slower contraction and more susceptibility to fatigue (Connelly et al 1999).
  - Decreased excitability (Porter et al 1994).
  - The marked decrease in skeletal muscle strength is due to a combination of biological changes, the accumulation of acute and chronic diseases, reduced physical activity and nutritional deficiencies (Fiatarone and Evans 1993, Doherty 2003).

Practical points

- Performing a task such as rising from a chair may require the frail older person to function near their maximum functional reserve capacity.
- An additional small deficit in muscle function, such as prolonged rest or acute illness, can tip an older person into dependency.
- Appell (1990) found a 3–4% daily reduction in muscle strength during the first week of immobilisation and up to a 40% decrease in isokinetic muscle strength after 3 weeks.
- Muscle atrophy also plays a role in the development of contractures.
- The physiotherapist should encourage the older person to keep as active as possible unless contra-indicated.

Bones and joints

- Ageing is associated with:
  - Universal loss of bone density from about the mid-30s onwards, accelerating after the menopause in women and in the mid-50s in men.
  - As we age, the balance between bone formation and re-absorption is upset, leading to a loss over the lifetime (Chan and Duque 2002).
  - Excessive cross-linkages makes cartilage less able to handle mechanical stress (Loeser 2004).

Practical points

- Increased stiffness of the connective tissues and degenerative changes in the joints contribute to a decrease in flexibility and range of motion (very small age-related loss) which may affect the ability to execute volitional or compensatory postural responses.

Gait and posture

- Ageing is associated with:
  - Reduced gait speed due to shorter step length and increased time in double stance

(Ferrandez et al 1990)
  - Reduced hip, knee and ankle movement (Judge et al 1996)
  - Increased anterior pelvic tilt (Winter et al 1990)
  - Larger degree of out-toeing
  - No difference in step width
  - No difference in foot clearance
  - Increased postural sway (College et al 1994)
  - Reduction in height and stooped posture although there are marked variations in older individuals.

Practical points

- The speed an individual chooses for daily ambulation is the most fundamental measure of gait performance.
- Some gait changes are related to subtle physiological changes in the sensorimotor system, but others are best explained as functional adaptations.
- Older people may unconsciously choose to walk in a manner that increases the proportion of time spent in stance and double support to increase stability.

Respiratory system

- Age-related changes begin slowly after the third decade but progress more rapidly after the sixth decade. Changes over time are a combination of biological factors (age-related), environmental factors (pollution) and personal/social factors (smoking).
- Ageing is associated with:
  - Increased stiffness of the chest wall
  - Decreased strength of intercostals and accessory muscles of respiration
  - Enlarged alveolar ducts/alveoli
  - Decreased elasticity and increased cross-linked collagen
  - Increased functional reserve and closing capacity
  - Decreased local pulmonary vascular regulation
  - Reduced chemoreceptor and muscle response
  - Reduced effectiveness of cilia (Hampton et al 1997).

Practical points

- Despite these changes, the respiratory system is capable of maintaining adequate oxygenation and ventilation during the entire lifespan.
- However, the respiratory system reserve reduces with age, and diminished ventilatory response to hypoxia and hypercapnia makes older people more vulnerable to respiratory failure during high demand states, e.g. heart failure, pneumonia.

Cardiovascular system

- Ageing is associated with:
  - An increase in heart weight
  - Thickening of the endocardium and the semilunar and atriaoventricular valves
  - Stiffening of the artery walls
  - Increased peripheral vascular resistance
  - A decrease in cardiac output
  - A decrease in heart rate and maximal heart rate (Hampton et al 1997).

Practical points

- The ageing heart can significantly increase its maximum output and allows older people to perform vigorous exercise, although not up to the same intensity as a younger individual.

Autonomic nervous system

- Ageing is associated with:
  - Abnormal central and peripheral thermoregulatory responses leading to reduced ability to regulate body temperature (Kenney and Munce 2003).

Practical points

- Extra precautions should be taken during strenuous exercise and hot conditions.

Genitourinary system

- Ageing is associated with:
  - A decrease in weight and volume of the kidney (20–30% by age 90)
  - Reduction in glomeruli by up to 50% over the lifespan
  - A decrease in proximal tubule volume and length
  - Reduction in bladder capacity
  - Loss of muscle tone resulting in difficulty in emptying the bladder or in some cases involuntary loss of urine (Hampton et al 1997)
  - The ageing kidney has a lowered reserve. Kidney disease or acute illness can have serious effects on renal function.

Gastrointestinal system

- Ageing is associated with:

- Reduction in the intestinal mucosa blood flow
- Atrophy of the musculature of the intestinal wall
- Reduction in vitamin and iron absorption (Hampton et al 1997)
- The gastrointestinal system functions well in healthy older people
- However dietary neglect, disease and medication may lead to an altered nutritional status.

Recognising delirium

- Delirium (acute confusional state) is a common condition in older people affecting up to 30% of medical (Siddiqi et al 2006) and up to 50% post fractured neck of femur patients (Marcantonio 2000).
- Delirium is characterised by an acute (hours to days), fluctuating change in mental status with inattention and altered levels of consciousness.
- There are two main types:
  - Hyperactive delirium: agitation and visual hallucinations
  - Hypoactive delirium: lethargy and withdrawal.
- There are many precipitating factors including immobility, malnutrition, intercurrent illness, dehydration and stress of admission to hospital or other unfamiliar settings (Elie et al 1998).
- It is important that the physiotherapist is able to recognise the signs of delirium and feedback to the MDT.
- Symptoms generally resolve when the underlying cause is treated.

Adapting assessment of older people with cognitive impairment

- Poor memory means that history taking is often difficult and to obtain a clear idea of the presenting problem may take time.
- Older people with cognitive impairment may not be able to recall how long they have had a physical problem or pain.
- The physiotherapist needs to recognise confabulation – filling in gaps in their memory with false memories.
- Information may have to be supplemented by a family member or a person that knows them well.
- Initial approach:
  - Approach the person slowly from the front
  - Respect personal space
  - Address the person by name and make eye contact
  - Keep hand and body movement smooth and unhurried

  - Speak clearly, in a manner acceptable to an adult
  - Make use of facial expression
  - Be courteous.
- Verbal strategies:
  - Give the person plenty of time
  - Use short sentences
  - Limit requests to one at a time
  - Use repetition, and change wording if necessary
  - Experiment with words and expressions
  - Avoid inviting a refusal
  - Use word requests in a positive way
  - Give step-by-step instructions
  - Use word requests for an automatic response
  - Use tone of voice to suggest the ease of the task
  - Watch the person's reactions to requests.
- When there are two therapists attending the person, only one should speak (Oddy 2003).
- The timing of the assessment can affect the outcome.
- Greater accuracy is likely if the activity is carried out at the appropriate time of the day, e.g. bed transfers assessed in the morning rather than the afternoon.
- Remember to gain insight into night time by asking carers and/or nursing staff.
- The assessment of activities such as walking also needs special consideration since the level of performance may be variable through the day.
- The physiotherapist should assess the older person at different times in order to measure the extent of these variations.

Subjective assessment: where information may be found and the level of detail required

- Information sources: patient, next of kin, carers, medical records, 'passports': e.g. learning difficulties, dementia, health and social care records (IT systems), other health care professionals involved in the care of the older person, such as district nurse, community matron, community psychiatric nurse (CPN).
- An older person may report abuse. Reassure the person and ensure that you are aware of the safeguarding of older adults policy, so you know what procedures you should follow.
- Cognition: be aware of the person's orientation to place, person and time. In the acute hospital environment, the doctors and/or occupational therapists may perform cognitive screening tests, e.g. Abbreviated Mental Test Score (AMTS) or Mini Mental State Examination (MMSE)
  - AMTS: scored out of 10. A score of less than 7 indicates some cognitive impairment

- MMSE/Folstein: scored out of 30. A score ≥25 points is effectively normal (intact). Below this, scores can indicate severe (≤9 points), moderate (10–20 points) or mild (21–24 points) cognitive impairment.

- Mood: be aware of the person's level of engagement during the subjective assessment.
- Red flags include:
  - Sadness
  - Fatigue
  - Abandoning or losing interest in hobbies or other pleasurable pastimes
  - Social withdrawal and isolation
  - Weight loss and/or loss of appetite
  - Sleep disturbances
  - Loss of self-worth
  - Increased use of alcohol or other drugs
  - Fixation on death; suicidal thoughts or attempts
  - Unexplained or aggravated aches and pains
  - Lack of interest in personal care (missing meals, neglecting personal hygiene, forgetting medications)
  - Memory problems.

History of the present condition

- What movement difficulties are they experiencing, how long ago was it that they were able to do the particular activity (days, weeks, months) and what do they think is stopping them?
- If the person finds it difficult to remember what activities are difficult, asking about their normal daily routine may be helpful.
- What does the person understand by their condition?

Pain

- Ask the older person if they have any pain at rest or on movement.
  - Use a range of alternative words to describe pain, e.g. sore, aching
  - Ask about the nature, location and intensity of pain
  - Ask about impact on functional abilities and participation
  - Ask the person to locate the pain either by asking them to point to the area on themselves or use a pain map/body chart
  - Use standardised scales in a format that is accessible to the individual.
- Self-report assessment scales such as the Numerical Rating Scale (NRS) and the Verbal Rating Scale (VRS) are recommended (Concise Guidance to Good Practice Number 8: The assessment of pain in older people (RCP 2007)).

Specific questions on falls history

- How many slips, trips or falls in the last 12 months?
- Include the descriptors of slips and trips as some older people may consider a trip as insignificant. If it was a slip or trip, clarify what exactly caused it?
- What was the individual doing at the time of the fall? A detailed history is essential, including location of the fall.
- Did anyone witness the fall?
- What injuries were sustained as a result of the fall? Does the pattern of injury described and/or seen fit with the details of the fall?
- Watch for those who have sustained black eyes or facial bruising/fractures. Facial injuries may result from falls due to syncope (Wade et al 2004).
- Was the individual able to get up from the floor? How did they summon help? Many older people do not injure themselves in a fall, but are unable to get up from the floor and may stay on the floor for some time (Wild et al 1981, Vellas et al 1987, Tinetti et al 1993).
- Any loss of consciousness? Again this suggests a medical reason for falling.
- Any signs/symptoms before the fall? Ask the person to describe the symptoms.
- Dizziness is a common symptom.
- Many different feelings can be described as dizziness.
  - Vertigo is often described as a spinning sensation. The person may feel that they are moving or that the surroundings are moving while they remain still. Vertigo usually occurs when a person is standing but can occur while sitting, lying down, or changing position. People with vertigo may also have nausea, sometimes with vomiting, and nystagmus. Benign paroxysmal positional vertigo (BPPV) is a common cause of dizziness in older people. Symptoms are almost always precipitated by a change in head position, e.g. getting out of bed or rolling over in bed.
  - Presyncope is often described as a feeling of light-headedness, generalised weakness and a sense of 'going down'. It can be cardiogenic, e.g. arrhythmia or situational. Older people may report light-headedness or faintness after moving from supine to standing or sitting to standing that can occur up to 5 minutes after the change in position (Craig 1994). Numerous diseases have been found to be associated, including heart failure, Type 1 diabetes, Parkinson's disease, stroke, dementia and depression (Mathias 1995, Tivlis et al 1996). The physiotherapist needs to be alert to small clues, e.g.: reluctance to walk or participate in any activity that requires an upright posture, sitting down hurriedly or becoming pale on standing.
  - Dysequilibrium is a sense of unsteadiness or loss of balance. The person may feel that they need to hold onto something to maintain their balance.
- Fear of falling: are there any activities that they avoid or are concerned about performing? Fear of falling is prevalent among community-dwelling older people and may be independent of fall injuries or previous falls (Howland et al 1998, Bruce et al

2002). Prospective studies have shown that fear of falling predicts deterioration in physical function, decreased activity and admission into care homes (Cummings et al 2000, Vellas et al 1996).

- Fear of falling is a predictor of falls (Mendes de Leon et al 1996, Delbaere et al 2010). Fear of falling may impact on the older person's participation in physiotherapy assessment and intervention.

Past medical history

- Identifying pre-existing disease that may be contributing to risk of falling and/or functional problems is an important component in physiotherapy assessment.
- Lower limb problems, e.g. osteoarthritis of the hip or knee with muscle wasting of associated muscle groups, reduced range of movement and pain has a detrimental effect on postural stability and has been shown to increase risk of falls (Sturnieks et al 2004, Arden et al 2006).
- Neurological disease that affects muscle power, balance, gait, sensation or ability to plan and execute locomotor activities will impact both on functional performance and falls risk.
- CVA, Parkinson's disease and peripheral neuropathy have been associated with an increased risk of falls (Burns 1994, Richardson and Hurvitz 1995, Herndon et al 1997, Jorgensen et al 2002, Allcock et al 2009).
- Urinary incontinence, frequency, nocturia and rushing to the toilet to avoid incontinence are associated with increased risk of falls and fractures (Brown et al 2000, Chiarelli et al 2009).
- Cognitive impairment and dementia increase the risk of falls and fractures (Kallin et al 2005).
- The most common types of dementia are:
  - Alzheimer's disease: gradual onset of memory impairment including disorientation to time and place, difficulty with abstract thinking and familiar tasks, poor or decreased judgement. Gait and balance impairment occur in the later stages of disease.
  - Multi-infarct dementia: stepwise progression with focal neurological signs and symptoms and memory impairment.
  - Lewy body dementia: progressive memory impairment, visual hallucinations, fluctuations in autonomic processes, signs of parkinsonism (tremor, rigidity, festinating gait), recurrent falls.
- Visual impairment such as cataracts, macular degeneration and glaucoma exacerbate age-related visual loss and thereby decrease postural stability and increase falls risk (Ivers et al 1998, Wood et al 2009). Use of multifocals has been reported to increase falls risk as the near-vision lenses impair distance contrast sensitivity and depth perception in the lower visual field (Lord et al 2002).
- Any previous fragility and fractures?

Drug history

- Note medication prescribed.
- How does the older person manage their medications?
- Research shows that the greater the number of medications (four or more) taken the greater the risk of falls (Lipsitz et al 1991, Leipzig et al 1999a, 1999b).
- Polypharmacy increases the risk of drug interactions as well as adverse reactions which include confusion, fatigue, urinary incontinence, constipation and orthostatic hypotension (Monane and Avorn 1996).
- Some medications have been associated with increased risk of falls. These include antidepressants, antipsychotics, anticonvulsants and benzodiazepines (Ensrud et al 2003).
- Some medications can impair mobility, e.g. antipsychotics, benzodiazepines, anticonvulsants (Robin et al 1996). The physiotherapist might be the first person to link impaired gait with the older person's medications.
- An individual might not report or recall all of their medical conditions. Knowledge of medications will give you important information about a person's medical history.
- If you are working in a hospital, each ward will have a British National Formulary (BNF) which provides practical information on medications.

Social history

- Accommodation:
  - Lives alone?
  - Detail of access into and within the property
  - Stairs/steps and position of rails
  - Equipment already in situ, e.g. bed lever, riser recliner chair, raised toilet seat
  - Location of rooms.
- Formal and informal networks plus frequency/adequacy of support/sustainability:
  - Always consider the health of an informal carer, their lifestyle and other responsibilities.
  - An older person may be admitted to hospital not because of deterioration in their own condition, but because of a change in the health or circumstances of their carer.
- Exercise tolerance:
  - Distances walked and level of assistance required, outdoor mobility
  - Use of walking aids, what, why and for how long?
  - Ability to climb stairs
  - Ability to use public transport.
- Care home resident:
  - Care homes may send a transfer summary or a 'passport' with the older person if

they come to hospital which can provide a useful insight to function.
  - Make contact with the care home and confirm normal level of function with a named staff member.
  - Confirm whether the care home is residential or nursing.
  - Clarify whether there has been a change in function and the time frame of change.
  - The staff member may report specific functional difficulties which can help you focus your assessment.
- Use of alcohol:
  - Be aware that some older people may have been dependent upon alcohol during their life; also a group of older people who begin to drink excessively for the first time in old age (O'Connell et al 2003).
  - Patients frequently do not volunteer this information or may deny it if questioned directly.
- Any previous physiotherapy intervention and outcome?

Reasoning behind the choice of objective testing or measurements to be carried out and tips on how best to apply these

- Tests of everyday functional ability should be appropriate to the older person's ability level and needs which have been established by subjective history taking.
- In practice, older people will need to attempt many of the same daily activities such as getting out of bed, rising from a chair, standing and walking including walking outside or across a road.
- The tests should be started at a level which allows achievement of the test.
- The sequence should be halted before failure seems certain.
- If success is in doubt, help should be provided and sufficient time to give the person opportunity to succeed.
- If the person varies in performance from day to day, or morning from evening, tests should be repeated on several occasions to get a fuller picture.
- For a frail person, the tests may need to be conducted over several sessions.
- Choose procedures that capture the most information with the least number of activities.
- Muscle weakness correlates with several measures of functional status (Skelton et al 1994). Assessment of sit to stand will provide important information on functional ROM, muscle strength, exercise tolerance and balance that may be more relevant to identifying functional problems than traditional ROM and muscle strength assessment.

Objective assessment: tools or techniques specific to older people

- Observation:
  - Level of alertness and posture
  - Muscle bulk, skin condition, condition of hands, nails, teeth and clothing
  - Older people with very severe cognitive/communication impairment may not be able to self-report pain. Look for behavioural responses such as facial expression, change in body movements and activity patterns, change in mental status, e.g. confusion, aggression, or autonomic changes such as pallor or tachycardia. Assessment should include insight from carers and/or family members to interpret the meanings of their behaviours.
- Upper limbs:
  - ROM similar to that of young people. Minor degrees of limitation may not affect function.
  - Screen ROM by asking the older person to raise their hands over their head and behind their back. Further MSK assessment may be indicated.
  - Feel muscle tone.
  - Rigidity may be most easily detected at the elbow and wrist.
  - Outstretched hands: assess for tremor and drift of the limb.
- Lower limbs:
  - ROM similar to that of younger people. Further MSK assessment may be indicated.
  - Feel muscle tone.
  - Contractures develop quickly if immobile for a short period or the older person spends the greater part of the day in a chair.
- Muscle strength: in sitting
  - Test hip flexors/abductors, quadriceps, ankle muscles.
  - In large prospective studies, reduced quadriceps strength has been found to increase the risk of falls and fractures (Campbell et al 1989, Nguyen et al 1993, Lord et al 1994).
  - Lower limb strength muscle weakness has also been found to be associated with falls, particularly the knee and ankle muscles (Tinetti et al 1993, Whipple et al 1987, Nevitt et al 1989, Studenski et al 1991, Wolfson et al 1995).
- Feet and footwear: Ask the older person to remove their socks
  - This will give you information about flexibility and dexterity as well as observing condition of skin, nails, callous formation and deformities.
  - Foot problems are a contributing factor to mobility impairment in older people. Older people with painful feet walk more slowly (Guralnik et al 1994) and have more difficulty performing ADLs (Benvenutti et al 1995). An Australian cross-sectional study found that foot problems were associated with impaired balance and function as well as history of multiple falls (Menz and Lord 2001).
  - Examine footwear for signs of wear.
- Balance: what activities does the older person need to do?
  - Sitting: what support is required to maintain balance?
  - Can the patient sit unsupported with both feet on the floor?

- How long can they maintain this position?
  - What degree of independent activity can be carried out?
  - Standing: what support is required to maintain balance?
  - Can the patient stand unsupported?
  - How long can they maintain standing?
  - What degree of independent activity can be carried out?
  - Do they widen or change the base of support?
  - Do they use their hands for support?
- Transfers: observe the pattern of movement, speed, quality and safety plus ease of the task.
  - Do they weight bear more on one leg?
  - Do they position one leg behind the other?
  - Do they use their hands?
  - Do they widen or change the base of support?
- Document the height of the chair and bed that you are assessing from. Is this similar to the home environment?
- Gait: If possible, analyse gait as the patient walks into the treatment room, within their property or around the bedside.
- Consider the environment especially in the acute setting (the familiarity of home, use of furniture, different floor coverings). Initiation of walking, presence of freezing, ability to start and stop (any hesitation).
  - Locomotion: width of base, foot clearance, arm swing, step length, step timing, variability of stepping, weight transfer, heel strike, head position, general posture
  - Quality and safety of turning
  - Reactions if imbalance occurs
  - Use of walking aid and appropriateness
  - Exercise tolerance
  - Ability to walk outdoors including kerbs, slopes, uneven ground, use of public transport, getting in and out of a car
  - Steps and stairs. An older person may need to be able to negotiate steps/stairs in other properties rather than their own
  - Obstacles.
- Dual tasking: is the older person able to walk and talk? There is growing evidence that gait changes in dual task conditions are associated with an increased risk of falls (Beauchet et al 2008).
- Frail older people have been shown to stop walking when they start a conversation with a walking companion (Lundin-Olsson et al 1997).

Treatment planning: based on subjective and objective assessment findings

- Identify the physical and any psychological impairments contributing to the functional problem.
- Consider the extent to which each factor is limiting the older person's ability to function and the degree to which physiotherapy can modify each factor.
- Rank the problems in order of priority.
- Ask the older person:
  - 'What are the most important tasks that you will need to do to look after yourself (by yourself/help from carer)?'
  - 'Right now, which of these tasks are you NOT confident that you will be able to do?'
- Focus on a small number of problems.
- Empower the older person to set their own goals.
- Make sure that you discuss their potential for improvement.
- Sometimes the physiotherapist may need to consider the goals of the family/caregiver.
- Be aware that the older person's goals and the caregiver's and/or physiotherapist's idea of what is safe to achieve may be different.
- In these cases, consider the individual's rights and their capacity to take risks.
- The physiotherapist's role is to highlight the risks and try to minimise them as much as possible.

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Chapter 7

E-materials

Author profiles

Louise Briggs MSc BSc(Hons) MCSP

Louise has worked in older peoples' services since 1993 and has particular interest in service development in falls, fragility fractures and dementia. She currently works at St Georges Healthcare NHS Trust as AHP Therapy Consultant and is an Honorary Lecturer at St Georges University.

Louise is also a project officer of AGILE and provides specialist advice to various national committees.

Case Study 7.1

Background

- Mr L is an 86-year-old man who lives with his wife in a house (3 steps with two rails into the property).
- His wife (82 years old) is the sole carer and assists with personal care, medication and all domestic activities of daily living.
- Mr L goes to a day centre twice a week.
- The bedroom and bathroom are upstairs (stair lift) and he usually gets up at night to pass urine.
- He is mobile with a wheeled frame indoors but sometimes forgets to use it and he has an attendant-propelled wheelchair for outdoor mobility.

History of present condition

- Mr L was admitted to hospital with pyrexia, urinary frequency and incontinence.
- His wife reports that he had been become increasingly confused and had 2 falls in the last week, each time, their neighbour had to help him up from the floor.
- His past medical history includes vascular dementia, osteoarthritis knees, COPD and stroke with residual left-sided weakness.
- His medications include simvastatin, paracetamol, clopidogrel, Ventolin and salbutamol inhalers.

Assessment on admission

- Mr L is diagnosed with a UTI and acute confusion.
- The medical management plan is IV fluids and IV antibiotics.
- The MTS is 5/10.
- The estimated date of discharge is 5 days.

Physiotherapy assessment

- The physiotherapist assessed Mr L the next day.
- He was found to be disorientated to time and place, but was able to follow one-step instructions. On admission Mr L's AMTS was 3/10.
- He could move his upper limbs through range. There was moderate rigidity on passive movement especially at the elbow and wrist of the left upper limb.
- He was able to move his lower limbs on command, but had residual weakness of the left lower limb especially the hip flexors and quadriceps (grade 4/5 Oxford scale) with reduced range of movement at the left ankle (plantargrade just achieved).
- The physiotherapist noted reduced muscle bulk of the quadriceps bilaterally and degenerative changes in both knees.
- The physiotherapist and a physiotherapy assistant assessed Mr L's ability to complete bed transfers.
- He was able to transfer from lying to sitting with moderate assistance of 2.
- He appeared to be fearful of moving and required reassurance when rolling.
- He was able to sit unsupported on the edge of the bed.
- On the first attempt to stand using a wheeled frame, Mr L pushed himself backwards and tried to pull up holding on to the frame.
- To make the transfer to the chair safer, the physiotherapist used a rota-stand with the assistance of 2.
- The physiotherapist gave a handover report to the nurse in the bay and documented Mr L's current functional ability.
- The physiotherapist identified that Mr L was unable to transfer independently (lying to

sitting and sit to standing) due to fear of falling and when moving from one position to another. In addition he had generalised weakness precipitated by the acute illness.

- He was at risk of falls due to cognitive impairment with possible delirium, residual left-sided weakness and reduced muscle power in addition to gait and balance impairment.
- The physiotherapist also noted that Mr L had been unable to get up from the floor following his falls.
- When the physiotherapist discussed what Mr L would like to achieve, he stated that he would like to go home. The physiotherapist involved Mr L's wife in goal setting.
- The physiotherapist helped Mr L to break this goal down into smaller short-term goals. The short-term goal was to be able to transfer consistently with assistance of one in 2 days and to mobilise with a rollator frame 6 metres with assistance of one in 4 days.
- The Elderly Mobility Scale was chosen as an outcome measure (initial score 0/20).
- The physiotherapist referred Mr L to the occupational therapist.

Treatment

- The treatment plan included a combination of daily specific functional transfer practice with the occupational therapist on lying to sitting, sitting to lying and transfers from the bed, chair and toilet.
- The physiotherapist also prescribed balance exercises in standing with bilateral upper limb support and progression to less support.
- Gait re-education was commenced in parallel bars and progressed to mobilising with a wheeled frame with a chair placed in strategic places.
- The physiotherapist arranged treatment sessions with his wife present so that she could see how her husband was progressing.
- The physiotherapist increased the practice sessions by delegating to the physiotherapy assistant and health care assistant in the bay.
- This ensured that mobility practice could take place throughout the day.
- Over the next 3 days, Mr L is more orientated (MTS 7/10) and is able to transfer with supervision and mobilise 5 metres with a wheeled frame and supervision.
- The Elderly Mobility Scale improved to 8/20.
- Stepping practice onto the first step of a set of stairs with bilateral hand rails was added to the treatment plan.
- The nurses reported that Mr L managed to use a urinal bottle independently at night-time.

Outcomes

- The multidisciplinary team met with Mr L and his wife to discuss his progress and to plan for his discharge.
- Mrs L wanted to continue being the sole carer for her husband, but was concerned that

Mr L may fall again.

- The options for further assessment and management of falls risk were discussed with Mr L and his wife.
- The multidisciplinary team referred Mr L to the Intermediate Care team for further rehabilitation at home plus a falls clinic appointment.
- The social worker provided information about voluntary agencies that can provide sitting services.

Case Study 7.2

Background

- Mrs Clarke is 85 years old.
- She lived alone in a first-floor flat, her husband died 10 years ago.
- Mrs Clarke was able to walk around her flat, sometimes holding on to furniture to steady herself.
- She had not been out of the flat on her own since a fall 6 months previously, but was able to go to the supermarket with her daughter occasionally, getting around the supermarket by using a trolley for support.
- Her daughter visited her every day to prepare her evening meal.
- Mrs Clarke drank a small glass of sherry most evenings before her meal.

History of present complaint (HPC)

- Mrs Clarke had four falls in the past 6 months.
- The falls tended to happen indoors, when she was turning or reaching up.
- She did not feel dizzy and has never had a blackout, but sometimes felt lightheaded on standing up.
- She fractured her wrist when she fell in the kitchen 6 months ago.
- So far, she has been able to get up after falling.

Past medical history (PMH)

Her PMH includes hypertension, osteoarthritis in her knees and glaucoma.

Drug history (DH)

Aspirin, bendrofluazide, ramipril, co-codamol, temazepam, eye drops for glaucoma.

Management

She was referred to the multidisciplinary falls clinic by her GP, which she attended with her daughter.

Mrs Clarke felt that her balance and walking had deteriorated over the past 6 months and she wanted to be more confident walking outside.

Physiotherapy assessment

- Although Mrs Clarke was able to transfer independently and safely she was unable to transfer without using her arms.
- She was unable to stand on one leg.
- Gait assessment showed increased time during double stance, variability in stepping, reduced heel strike and unsteadiness on turning.
- Mrs Clarke was unable to walk and talk at the same time.

Multidisciplinary team (MDT) assessment

The MDT identified a number of falls risk factors:

- Reduced muscle strength of the hip abductors and extensors.
- Quadriceps muscle lag.
- Gait and balance impairment.
- Visual impairment.
- Night time sedation.
- Postural hypotension.
- Alcohol intake.

Physiotherapy treatment

- Physiotherapy intervention included twice-weekly progressive muscle strengthening with Thera-Band and weights, balance re-education, floor work and gait re-education in the 'Stay Steady' group.
- The group had weekly health promotion talks including bone health and importance of physical activity.
- The physiotherapist provided a home exercise programme concentrating on strength and balance exercises with visual and written instructions to be completed twice a week.
- The physiotherapist organised a graduated walking programme for outdoor mobility conducted by a technical instructor.
- Discussions were held with Mrs Clarke to ascertain what she would do if she fell again.
- Information was provided about care-alarms.
- The physiotherapist chose FES1 (38/64) together with Berg Balance scale (40/56), Turn

180 (8 steps to the left and 7 steps to the right) as outcome measures.

- The physiotherapist explained to Mrs Clarke that continuing to exercise regularly would help her to stay active and healthy.
- Mrs Clarke was encouraged to attend a local exercise group run in the community hall specifically for older people.
- During Mrs Clarke's last treatment session a health promotion talk was conducted by one of the older people who attend the local exercise group.
- Mrs Clarke agreed to be referred to the community exercise programme.

Outcomes

- After the 12-week programme, Mrs Clarke's gait and balance outcome measures were found to have improved (Berg Balance Scale 50/56 and TURN 180 6 steps in both directions).
- There was no change in the FES1 but Mrs Clarke reported that she had been walking to the local newsagent for a paper in the morning over the past 2 weeks.

Case Study 7.3

Background

- Mr Jones, 80 years old.
- He lived alone in a flat with a flight of stairs to access the property (no rails).
- Mr Jones mobilised with a stick indoors and used a shopping trolley outdoors.
- He liked to have a bath, but had found this becoming more difficult.
- He was able to manage the shopping and had a friend to assist with his laundry.
- He was known to the community cardiac failure nurses, but had no formal social service input.

History of the present complaint (HPC)

- Mr Jones was admitted to hospital with cardiac failure.
- This was his third admission to hospital with an exacerbation of cardiac failure.
- He reported that on the morning of his admission his legs felt as if they were giving way and he nearly fell.

Past medical history (PMH)

CCF, bilateral hernia repair and cataracts.

Drug history (DH)

Lisinopril, furosemide, metoprolol.

Management

- He was managed medically initially which included intravenous furosemide, and oxygen therapy.
- The EDD was 7 days.
- Mr Jones was referred to the dietician who prescribed nutritional supplements.

Physiotherapy assessment

- On initial assessment, Mr Jones was breathless at rest.
- He was cachetic with reduced muscle bulk of the upper and lower limbs.
- Bilateral lower limb swelling was present below the knees and the physiotherapist noted that he had cut the uppers of his slippers.
- Although he was able to move independently from lying to sitting, he was reluctant to stand up and move around.
- Mr Jones reported that he felt very anxious about his breathlessness and also felt that his legs were going to give way if he walked across the bay.
- Mr Jones was worried that he would not be able to manage the stairs at home and dreaded becoming housebound.

Physiotherapy treatment

- Initial physiotherapy intervention included teaching Mr Jones ways of managing his breathlessness and showing him positions of rest.
- As Mr Jones' breathing improved the physiotherapist added a muscle-strengthening programme which included cycling with pedals and functional transfer practice.
- The physiotherapist also referred him to the occupational therapist for assessment of his PADLs and DADLs.
- Mr Jones set his own mobility goals by deciding on a distance that he could walk on a daily basis, with a chair being placed at the distance that he set.
- Initially Mr Jones used a wheeled frame to mobilise across the bay.
- The physiotherapist monitored Mr Jones's heart rate and oxygen saturation during mobilisation and taught him how to self-monitor and pace himself.
- Step-ups were added to the exercise programme.
- By the 4th day of admission, Mr Jones was able to mobilise independently to the toilet with a wheeled frame.

- The physiotherapist reviewed the need for long-term walking aid prescription by assessing Mr Jones in the parallel bars with his stick.
- He was able to walk independently and safely with a stick with occasional touches of the bar for support.
- By the 5th day of admission, the physiotherapist assessed Mr Jones on the staircase in the therapy gym.
- He was able to ascend and descend the steps safely with one rail, but was unsteady when no rails were present.
- The physiotherapist considered that Mr Jones would benefit from the installation of one rail on his staircase at home and liaises with the occupational therapist about this.
- The occupational therapist also prescribed a perching stool, a trolley for the kitchen and a bath-board.
- Mr Jones was also provided information about care-alarms.

Outcomes

- The therapists discussed the progress that Mr Jones had made during his acute stay.
- He felt that he needed some help at home initially as he did not feel confident that he could manage on his own.
- The multidisciplinary team recommended that Mr Jones was discharged with the intermediate care team visiting him at home in order to increase his confidence in his functional mobility and to assess his outdoor mobility once the stair-rail had been installed. A referral to tele-health was instigated by the multidisciplinary team.

Chapter 7 Gerontology multiple choice questions

1. Which of the following is *not* an age-related change in gait?
   a). Reduced hip movement
   b). Reduced gait speed
   c). Change in step width
   d). Reduced ankle movement
2. Which of the following is *not* suggestive of delirium?
   a). No change in level of consciousness
   b). Agitation
   c). Hallucinations
   d). Withdrawal/lethargy
3. Which of the following is *not* a main indication for prescription of a walking aid?
   a). Reduced distal lower limb proprioception
   b). Reducing falls risk
   c). Reduced muscle strength
   d). Pain on weight bearing
4. Which of the following medications can cause postural hypotension?

a). Antihypertensives
b). Diuretics
c). Antipsychotics
d). All of the above

5. What is the most common type of dementia?
a). Vascular dementia
b). Alzheimer's disease
c). Lewy body dementia
d). Frontotemporal dementia

6. Which of the following may be a behavioural response to pain?
a). Agitation
b). Aggression
c). Autonomic changes
d). All of the above

7. Which of the following is *not* amenable to physiotherapy intervention?
a). Muscle weakness
b). Reduced lower limb proprioception
c). Reduced dynamic balance
d). Impaired gait

8. How can exercise intensity be altered in resistance training?
a). Changing the number of repetitions
b). Changing the number of sets
c). Changing the weight used
d). All of the above

9. In order to be effective, balance exercises must be
a). Individualised and progressive
b). Context- and task-specific
c). Challenging
d). All of the above

10. Which sensory and neuromuscular factor has not been associated with evidence-based falls risk factors?
a). Visual contrast sensitivity
b). Muscle weakness
c). Reduced vestibular function
d). Poor reaction time

11. Which of the following balance and mobility factors has been associated with falls?
a). Impaired ability with transfers
b). Impaired ability to stand up
c). Impaired ability when leaning and reaching
d). All of the above

12. Which of the following medical factors are associated with falls?
a). Impaired cognition

b). Stroke
c). Parkinson's disease
d). All of the above

13. Which of the following can be a sign of depression?
a). Fatigue
b). Changes in sleep pattern
c). Loss of interest/participation in hobbies
d). All of the above

14. As part of falls management, the physiotherapist should always:
a). Discuss with the older person how they would summon help in the event of another fall
b). Discuss with the older person how they can reduce the risks of complications of a long lie
c). Check that if the older person has a pendant alarm, that they know how to use it
d). All of the above

15. Which type of exercise programme is not effective in reducing falls?
a). Dynamic balance and strengthening programme
b). Walking programme
c). Tai Chi
d). All of the above

16. How many hours of exercise (within an exercise programme) have been found to be most effective in reducing falls rates?
a). 10 hours
b). 20 hours
c). 40 hours
d). 50 hours

17. Which of the following outcome measures could be used to measure balance ability in a frail older person who is anxious about falling?
a). TUSS
b). Four step square test
c). Berg balance test
d). TURN 180

18. To maximise strength, how many repetitions should be used for each exercise?
a). 5
b). 8
c). 10
d). 20

19. To increase aerobic fitness, an older person should be working at what intensity on a scale of 0–10 where sitting is 0 and 10 is all-out effort?
a). 3–4
b). 5–6
c). 6–7

d). 8–9

20. If an older person is very anxious about falling when starting to walk, the physiotherapist should always:
    a). Over-consolidate standing before progressing to the next stage
    b). Encourage the older person to practise on their own
    c). Practise walking across the room with the physiotherapist
    d). All of the above

Gerontology multiple choice answers

1. c)
2. a)
3. b)
4. d)
5. b)
6. d)
7. b)
8. d)
9. d)
10. c)
11. d)
12. d)
13. d)
14. d)
15. b)
16. d)
17. a)
18. c)
19. b)
20. a)

Chapter 8

Learning Disabilities

Introduction

- People with learning disabilities (LD) will meet with all sorts of health professionals in all types of settings, from GP practices, outpatient clinics, general hospital inpatient wards and specialist clinics.
- This volume will address some of the difficulties, and issues faced by physiotherapists when assessing people with LD, whether in the generic or specialist services.
- Reference will be made to the legislation in the United Kingdom, e.g. 'Valuing people (DOH, 2001) and 'The same as you' (Scottish Executive 2000).
- The 'Death by indifference' report by Mencap (2007) highlighted six case studies where the National Health Service (NHS) failed to meet the needs of people with LD in general hospital settings, with the neglect resulting in unnecessary suffering and premature death.
- Three of the patients included in the case studies had chest complications, which were inadequately treated by physiotherapy.
- The report emphasised that the following health inequalities were experienced by people with LD and which need to be addressed:
  - People with LD were not a priority for the NHS
  - Many health care professionals do not understand how to work with LD
  - Health care professionals did not listen to family and carers
  - Health care professionals did not understand the law around capacity and consent
  - Health care professionals rely inappropriately on their own estimates of a person with LD.

What is a learning disability (LD)?

- LD is not a disease and is not an illness and will be evident from childhood, and in many cases without a clear cause.
- There are often links with pre- or postnatal injury or disease.
- There may also be links with genetics, chromosomal abnormalities or environmental factors.
- There is a historical perspective to LD which has resulted in people being excluded, institutionalised, labelled and deprived of their rights (Barrell 2007).
- The World Health Organization (1992) has defined learning disabilities as, 'a state of

arrested or incomplete development of mind'.

- LD is generally understood to be a combination of the following:
  - An intellectual impairment
  - Impaired social functioning
  - Identified early onset with an impact on development.
- LD can be divided into four very basic groups based on IQ scores:
  - Mild IQ score of 50 to 70
  - Moderate IQ score of 35 to 50
  - Severe IQ score of 20 to 30
  - Profound IQ score of less than 20.
- Those people with moderate or severe LD may also display other associated physical and mental health problems.

Prevalence of LD and profound and multiple learning disability (PMLD)

- The British Institute of Learning Disabilities (www.bild.org.uk), estimates that there are 1.2 million people with LD in the UK.
- According to research completed at Lancaster University (Emerson and Hatton 2005), approximately 985 000 people in England had a LD, around about 2% of the general population.
- Approximately 796 000 of these are over the age of 20. It was estimated that there were 21 000 people with PMLD.
- From Scottish statistics there is an indication that about 2–4% of the population have LD.
- The number of adults with LD is predicted to increase by 11% between the years 2001 to 2021 (Emerson and Hatton 2005).
- The prevalence of LD in the population over the age of 60 is predicted to increase by 36% from 2001 to 2021.

Profound and multiple learning disability

- The term PMLD is used to identify people with LD and additional disabilities.
- People with PMLD form a small, but significant section of the wider population of people with LD.
- Carnaby (2004) highlighted a difference of opinion relating to terminology.
- The definitions of profound intellectual disability most often cited include having an IQ of below 20 and describing individuals as those who are severely limited in their ability to understand or comply with requests or instructions. Most such individuals are immobile or severely restricted in mobility, incontinent, and capable at most of only the rudimentary forms of non-verbal communication (WHO 1992).

- People with PMLD are likely to be more vulnerable and require additional support with healthcare management, mobility and continence and the consequential outcomes.
- In practice, people with PMLD may learn to function within their environment using a variety of communication strategies.

Challenging behaviour

- There are specific conditions that can predispose an individual to display challenging behaviour.
- Emerson (1995) defined challenging behaviours as being 'culturally abnormal behaviours(s) of such intensity, frequency or duration that the physical safety of the person or others is likely to be placed in serious jeopardy'.
- A further definition states: 'behaviour which is likely to seriously limit use of or result in the person being denied access to, ordinary community facilities.'
- Types of challenging behaviour can be described as: aggression, self-injury, destructiveness, over activity, inappropriate social or sexual conduct, bizarre mannerisms or eating inappropriate objects.

Autism

- The concept of autism is broad, with it being described as a spectrum disorder.
- It can present as a subtle problem of social understanding and functioning or as profoundly severe disabilities.
- People on the spectrum are referred to as having autistic spectrum disorder (ASD) or in the absence of LD and in the upper regions of the intellectual quotient of the spectrum (IQ > 70) are defined as having Asperger's syndrome.
- People with LD may therefore exhibit autistic tendencies.
- Wing and Gould (1979) proposed that all people on the autism spectrum, irrespective of their cognition, have a triad of key impairments, which are:
  - Communication – including language impairment across all modes of communication from speech, intonation, gesture, facial expression and other body language.
  - Imagination involving rigidity and inflexibility of thought process, resistance to change, obsessional and ritualistic behaviour.
  - Socialisation – such as difficulties with social relationships, poor social timing, lack of social empathy, rejection of normal body contact, inappropriate eye contact.
- It is important for a physiotherapist to have an awareness of the effects of autism if linked to a person with LD, so that an approach can be appropriately adapted and an intervention designed to meet their individual needs.

Legislation

Mental Capacity Act (2005)

- The mental capacity act is relevant to physiotherapy as it covers the issues of consent and capacity.
- This is particularly pertinent for people with LD and the treatment they receive.
- It is a fundamental principle that people have the right to determine what happens to their body.
- This right is reflected in the rules of professional conduct and standards of physiotherapy practice (CSP 2005a).
- People with LD in the past have not necessarily been involved in decision-making and often professionals and carers may not have considered whether they have the capacity to make decisions.
- As physiotherapists, it is important to remember that touching a patient prior to obtaining valid consent may constitute battery under civil or criminal law.
- Gaining an individual's consent to assessment and treatment is more than a legal requirement; it is a matter of common courtesy and helps to establish a relationship of trust and confidence (CSP 2005b).
- Capacity must be assessed for each individual task, e.g. someone may be able to consent to aquatic physiotherapy by being at and seeing the pool and they consent by changing and coming to the pool area. However they may lack capacity to consent to a smear test or understand the consequences of not undertaking the test.
- Each situation has to be assessed individually and it cannot be assumed someone 'has capacity or not' as it depends on the nature of the task or demand.

Mental Health Act (2005)

- The Mental Health Act has provided a legal framework to protect vulnerable people.
- The act is underpinned by five key principles:
  - A presumption of capacity – every adult has the right to make his or her own decisions and must be assumed to have capacity unless it is proved otherwise
  - The right for individuals to be supported to make their own decisions
  - That individuals must retain the right to make what might seem as eccentric or unwise decisions
  - Best interest
  - Least restrictive intervention.

Knowledge specific to learning disability

Multi-disciplinary team (MDT)/multiagency working

- Physiotherapists working in the field of LD rarely work in isolation.
- They are generally based in a MDT made up of a variety of health care professionals; including specialist LD nurses, occupational therapists, speech and language therapists, psychologists and psychiatrists.
- Joint working is carried out with a number of professionals depending on the needs of the client.
- Close work also takes place with the care management team who are either social workers or occasionally LD nurses.
- Although some individuals live at home with family providing the main care, many individuals live in supported accommodation and therefore close working is essential with the care providers and local authority day services.
- Carers have either very limited medical knowledge or none at all.
- This is something that all physiotherapists should bear in mind when giving advice or training these staff.

Communication

- Many physiotherapists consider themselves to have excellent communication skills, but the usual verbal or written skills may be of limited use with someone who has LD.
- Working with this client group requires skills in both the delivery of information and comprehension of verbal and non-verbal messages.
- Speech and language therapists (SALT) can be a valuable source of information and there are courses available to gain a grounding in augmentative communication skills.
- However, courses are not always immediately accessible and therefore the skills need to be developed in light of increased awareness over time.
- It is often easy to make assumptions about someone's level of comprehension as many individuals develop ways of interpreting their environment, such as situational cues, where routine may play a part in understanding a message, e.g. asking someone if they want a drink, when you are holding a cup of tea, or asking someone if they want to go out, when you have their coat in your hand.
- The question itself may not be understood, but by holding a cup or coat the message is reinforced.
- Many clients use such 'objects of reference' to communicate or use simple signing.
- As individuals with LD may have no verbal communication, it is necessary to develop skills in other forms of communication and these are many and diverse.
- Individuals may express pain and discomfort in a variety of ways and skills in reading body language and facial expression need to be developed.
- Alternatively increased symptoms may be expressed through an increase in what may

appear to be ‘challenging behaviours’.

- Physiotherapists are often dependent on carers in these situations to describe changes in someone’s behaviour and from there a clear picture may emerge as to what is affecting the individual.
- For example; if an individual is uncomfortable in their seating, this may be expressed by self-injurious behaviour, as they may not be able to change their position to relieve pressure.
- They are reliant on others to interpret their need.
- When working with a diverse range of professionals and unqualified carers both written and verbal skills are essential and the ability to translate ‘jargon’ into easily understood language is necessary as carers assist with assessments and/or implementation of physiotherapy programmes.
- It is essential to ensure that carers are able to understand what is being said and what is required in order for the individual to receive the best management for their problems.

Conditions and diagnoses

- With advances in medicine generally, there are a number of specific conditions where in the past individuals rarely lived beyond childhood and therefore as they become adults, knowledge of how the condition presents is unknown. As a result physiotherapy management is difficult to predict requiring skills in treating the presenting symptom/s.
- Physiotherapists tend to work holistically with LD clients, which means they rarely treat a specific ailment or injury in isolation.
- People with LD may of course sustain injuries or experience conditions similar to the general population, therefore a knowledge of working with fractures, low back pain, arthritis, respiratory conditions and any clinical area in which physiotherapists work is necessary.
- Conditions need to be assessed and treated in relation to the individual’s LD, primary diagnosis if they have one and any challenging behaviour present, e.g.:
  - Clients with Down’s syndrome presenting with early-onset dementia, their general lax ligaments will have an effect on safe handling as they require increased physical assistance.
  - Individuals with cerebral palsy as they reach the fourth or fifth decade of life present with similar physical deterioration as post-poliomyelitis. This needs to be taken into account when planning for future accommodation needs.
  - Wheelchair-dependent clients may develop osteoporosis through lack of weight bearing and many other individuals may develop osteoporosis as a side effect of various medications.
  - Side effects of medications may lead to development of Parkinson-type symptoms.
  - Eating and drinking difficulties and dysphagia may develop in relation to the ageing process of cerebral palsy or dementia, where joint working with the speech and language therapist around appropriate posture and positioning takes place.

– Altered 'body shape' (e.g. scoliosis) resulting in poor respiratory function, pain and discomfort and decreased mobility.

Epilepsy

- 21% of people with a learning disability experience epilepsy, which increases to 50% with a diagnosis of cerebral palsy (Rennie 2007).
- Epilepsy has a profound effect on an individual's emotional, social and physical wellbeing, with seizures types varying from absences, myoclonic jerks, tonic–clonic and atonic, to more complex types.
- All of these can impact on a physiotherapy assessment and treatment programme, however, epilepsy should not be seen as a reason to avoid treatments such as aquatic or rebound therapy.

Transition

- Clients are usually accepted onto a caseload when in transition from the paediatric service and will remain within the adult LD team until the end of their life.
- In a special school, physiotherapy provision tends to be routine and therefore children are seen regularly.
- Many children with disabilities tend to access mainstream schools today, where they may only see a physiotherapist once a term or even annually at a medical review and therefore their physical presentation when they leave school and enter adult services may not be the optimum.
- Older children in the latter years of schooling may not consider physiotherapy a priority in their lives. The result can be that an individual's physiotherapy needs are greater in the initial transition phase.
- Good communication skills may be required to explain the nature of an individual's likely deterioration in skills and function and therefore the need for intervention. This explanation is often required not only to the individual themselves, but to family members and carers.
- Part of the role of the physiotherapist working with LD may be to facilitate services from primary care.
- Physiotherapists working in the acute sector may often feel unable to treat people with LD in a hospital situation, perhaps due to an inability to communicate effectively or a lack of knowledge and experience of working with individuals with a LD or challenging behaviour.
- If an individual is admitted to hospital following a CVA or a fracture for example, treatment and mobilisation to ensure a safe discharge may result in reduced levels of mobility and function which will need to be regained once the individual has been discharged home.

Approach to assessment

- Physiotherapists are trained to assess patients using specific assessment tools that tend to follow a set process, with each component of the assessment being carried out in a specific order.
- In non-LD practice a diagnosis is usually available prior to any assessment, therefore clinical reasoning can start before the individual is seen and treatment options considered in advance.
- With LD there is often no clear clinical diagnosis and therefore the physiotherapist may have no idea in advance of how the individual may present and therefore no opportunity to prepare specific assessment tools or interventions.
- The physiotherapists will need to be open-minded and flexible in order to effectively assess and treat someone with LD.
- A diagnosis of cerebral palsy does not indicate whether an individual is mobile with a mild hemiplegia, diplegic using a walking aid, independently mobile using a wheelchair or presenting with a profound and multiple disability.
- Similarly, a diagnosis of mild, moderate or severe LD gives no indication of an individual's level of communication or physical ability.
- It is essential that additional information is obtained from the referrer about an individual's general presentation before an assessment is considered.

History

- Due to potential communication difficulties it is often not possible to gain a history directly from the individual themselves.
- Therefore this information should be gained in advance (where possible) from family members, carers, case/care manager and other appropriate professionals.
- However, it should be borne in mind that different carers might have different perceptions about an individual's past history or history of the presenting condition.

Assessment

- Due to a potentially limited attention span or behavioural difficulties, the time available for the assessment may be shorter than necessary and it may not be possible to complete the assessment in one go.
- The assessment may need to be carried out over two or more sessions. Therefore, it may be necessary to carry out the assessment on more than one visit and this may happen as a result of seeing the individual in unfamiliar surroundings or with different carers or for no obvious reason.
- Previous discussion with the referrer and/or carers, can help the physiotherapist to know what structure will be required and what assessment tools may be useful.
- As much of the assessment as possible should be carried out through observation and it is

necessary to retain information or be able to write brief notes, as it is not always possible to write things down at the time.

- At least one further visit is often required to fill in any blanks that may have been missed out on previous visits.

Examples of different approaches to assessment

- Knowledge about a mobile client can be gained about their gait pattern, weight-bearing and muscle power, as they walk into the assessment area.
- It should not be necessary to ask the individual to specifically perform these tasks and indeed they may not understand why this would be required.
- Discreet observation can be carried out as a client mobilises around a familiar environment, without them being aware that they are being formally assessed.
- This alternative gathering of information can help to provide an insight into someone's mobility levels and possible influences of pain.
- If a client is wheelchair-dependent, information about their sitting balance and seated posture can be gained straight away through observation alone.
- That an individual is assisted to transfer using a hoist will in itself give information about their ability to weight bear or transfer. The type of hoist or sling used can provide further insight, e.g. if an individual is transferred with a full sling, this indicates increased dependence and possible poor trunk control, whereas to use a 'dress' sling (occasionally described as a toileting sling), an individual must have a degree of trunk and upper limb control.
- The type of sling can also give information about an individual's continence as it requires more than one transfer to access a toilet if a full sling is used for transfers.
- If specific measurements of joint range are required, it may be necessary to enlist the support of a carer. This could be due to potential behavioural issues and/or the positive way a client relates to a particular carer.
- Discussing the assistance someone requires for personal care or how easy or difficult it is to assist someone to wash or dress can indicate any limitation in their hip or shoulder movements.
- The exact number of degrees of movement is rarely necessary as a general range for functional purposes is more often what is required.
- It is also important to consider who the assessment is for and why? Working as part of the MDT and also as part of an integrated team, which may include care managers, may lead to a number of requests for assessments for different reasons.
- Initial assessments may entail the physiotherapist carrying out an assessment identifying the appropriateness of the team referral and identification of specific assessment needs.
- Commissioners are involving physiotherapists and other members of the MDT in assessments for continuing care, with this process often being a joint procedure.

- Care managers may request assessments to establish levels of mobility and this can help formulate appropriate plans in respect of the person's housing needs, day service needs and/or residential placement.
- Moving and handling assessments will be required to reduce risk of injury to carers and clients.

Subjective information

- The physiotherapist has access to a 'toolbox' of assessments that can be adapted for use in LD.
- Barrell (2007) suggested that LD physiotherapists do not use a uniform assessment process because there is no single tool that would meet the needs of the individual.
- Barrell further suggests this is because LD is 'not a single medical condition with identifiable boundaries'.
- No two individuals with LD will have the same presenting features and problems.
- Even with known genetic conditions the variability within a group can be quite extensive.
- The range of abilities, disabilities and cognitive impairment can be vast, therefore any objective measurement has to be sensitive enough to be able to pick up on this variation.
- The student or junior physiotherapist coming into LD must therefore have a good basic knowledge of the more common genetic conditions and some of the likely problems that individuals may face and are referred to physiotherapy for; for example conditions with low muscle tone or lax ligaments such as Prader–Willi and Down's syndromes.
- The problems associated with the condition can be further compounded by weight problems.
- It is important not to get bogged down in the specific diagnosis and common presenting factors of known genetic conditions, believing it is important to know them all. It is more helpful to have access to good reference texts on genetic conditions and refer to them as necessary.
- It is more important to be able to recognise what the problem is and be able to assess and treat it.
- It is important that everyone recognises that individuals with LD are at the same risk of any of the secondary conditions and problems as faced by the general population.
- Barrell (2007) describes some of the assessment tools that can be used with LD, with many of these being geared towards measuring someone's abilities and function.
- They can be quite subjective, e.g. goal attainment scoring, where the physiotherapist who is familiar with the individual sets the goals for that person and then these are reassessed. The goals are therefore very client-specific and the time scales can be chosen by the client/carer and physiotherapist.
- As with most assessments of individuals with LD these formats rely on the physiotherapist having an in-depth knowledge of the client.
- History taking may not involve the client directly, with information being provided by families, carers and other agencies.

- Some clients have large files going back to the days of long-stay hospitals and there is a danger that the history passed down may be based on hearsay and preconceived ideas.

Objective testing

- Some valid reliable objective measurement tools can be applied to LD, e.g. the modified Ashworth Scale for assessing tone (Bohannon and Smith 1987, Barnes and Johnson 2008).
- Consideration must be given to the practical application of these measurements where a client may have long-standing hypertonus, contractures in their joints and associated muscle atrophy.
- If someone has global brain damage then this is not going to change, it may be possible to manage its manifestations with medication and physiotherapy, but it is never going to resolve.
- Some of the objective tests that Barnes and Johnson (2008) describe consider how muscles react during gait; however, for many individuals with LD this is something that they have never done or no longer do.
- Measurements such as the Goldsmith Windswept Deformity Measure are more specifically aimed at the postural problems associated with LD (Goldsmith et al 1992).
- This can only measure accurately intact hip joints that have not subluxed or dislocated. The latter two can only be definitely diagnosed by radiological evidence.
- Scoliosis is something encountered in LD and the component of the wind-sweeping phenomenon that pertains to spinal scoliosis is not measured using the Goldsmith's measure.
- Objective measurement of scoliosis tends to only occur when surgical intervention is being decided on or if a client has been reviewed regularly in a specialist clinic.
- For individuals that develop a postural scoliosis it is a challenge for LD physiotherapists to accurately measure this or overall asymmetrical posture.
- Digital photographs or video footage can be taken to monitor changes over time.
- It is imperative that consent is obtained and this can be the limitation in the use of this method of recording posture. Discussion around photographic evidence needs to be a MDT decision involving the client and/or their carers.
- Individuals with LD may also present with any acute or chronic condition that a member of the general population may have, e.g. rheumatology, orthopaedic or respiratory. Some more able individuals may be able to attend acute physiotherapy services, in general however most will be managed by their own LD physiotherapist.
- Assessment of such conditions will be the same in principle, but the physiotherapist assessing may have to modify their communication and handling skills to accommodate the individual's needs.
- Some of the objective measurements used to assess and treat may not be applicable, e.g. due to an individual's increased pain threshold, or the inability to distinguish between hot and cold or sharp and blunt, these may contraindicate the use of certain

electrotherapy modalities.

- LD physiotherapists have to be inventive in how they gather information and treat the individual.
- The objective assessment of problems follows the same basic elements as the methods used for the assessment of the general population, however there may need to be some modification of the implementation of tests to enable the recording of information.
- When dealing with respiratory problems there may be occasions when an individual's asymmetrical posture may make auscultation a challenge. The trunk may be rotated or their ribs and the pelvis overlap, causing impingement of the lung and reducing functional respiration.
- Generally when physiotherapists perform suction they assume that their catheter will pass easily down to the lungs, with LD there may be associated anatomical abnormalities that make suction difficult to achieve.
- Fitness testing objective measures can be used such as grip strength, peak flow, and flexibility. However, patience and repetition may need to be applied, as individuals with LD may be anxious and agitated when faced with new experiences.
- Individuals with balance problems can be tested using the 'Tinetti Balance Scale' or the 'Get Up and Go Test'. These are used by physiotherapists working with clients in elderly care and dementia settings.
- There may need to be some modification but the core elements would be the same.
- A student or junior physiotherapist probably has all the objective assessment skills needed for working in LD, they just need to learn to be flexible and inventive in how they use them.
- When on placement or on rotation there will be more experienced physiotherapy staff that will be able to provide guidance during assessments.
- The physiotherapist may need to refresh their memories about how to use specific tools, but they will be able to demonstrate different ways of communicating and adapting the implementation of the tests.
- The objective measurements learnt during undergraduate training may or may not be useful in LD. If used some may not be sufficiently sensitive to monitor the small changes that LD individuals may undergo, e.g. the Physical Ability Scale (PAS) that has 7 levels evaluating sitting ability. PAS may be useful for gross movement evaluation, e.g. for LD clients that have had a stroke, but for more complex individuals the skills needed to show change from one level to another tend to be too great. Therefore monitoring sitting ability using this scale may show negligible change despite the individual improving in many areas.
- Outcome measures can be adapted to suit a specific clientele. For example, the Aquatic Therapy Association of Chartered Physiotherapists (ATACP) has promoted the use of an adaptation of Measured Yourself Medical Outcomes (MYMOP) (Paterson 1996).
- Within objective assessments goal setting is seen as an important part of the whole approach.
- If a patient with LD sustains a fracture, then the time scales for healing should be no

different from the general population.

- However, for those LD clients with more complex problems their short- and long-term goals will vary greatly compared to patients without LD presenting with similar physical problems and being managed in the acute setting.

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Chapter 8

E-materials

Author profiles

Nicola Harmer GradDipPhys MCSP

Nicola has worked with adults with learning disabilities for the past 20 years in South Wales. In 2001 she became the manual handling advisor for the Directorate of Learning Disability Services, Abertawe Bro Morgannwg University Health Board and was a contributor to the development of the manual handling guidance published by the Chartered Society of Physiotherapy in 2008.

Sue Standing MSc MCSP

Sue is a specialist physiotherapist working with people with learning disabilities and profound and multiple learning disabilities (PMLD). Sue worked for 14 years in special schools developing skills in assessment, posture management and aquatic therapy (hydrotherapy).

Sue set up services for adults with LD in Spelthorne before moving to Southampton to support the closure of the long-stay hospital and develop community physiotherapy services for the clients in Southampton and Hampshire.

Sue gained a Masters Degree in Applied Psychology (LD) in 1996 and her service was nominated for a Health Social Care award in 2001.

Sue has been an active member and Chair of the ACPPLD and has contributed to several

text books on the subject of physiotherapy for people with learning disabilities. Sue is an expert witness for people with LD and has worked as honorary Physiotherapist to the Rett Association.

Andrea Hounsell MSc BSc(Hons) MCSP

Andrea is a Physiotherapy Team Leader in the Learning Disability Directorate of the Abertawe Bro Morgannwg University Health Board.

Andrea has worked in learning disability services in the Cardiff area since 1993. During this time she has been involved in many developments within this field.

Andrea has always taken a keen interest in clinical education. As such she takes part in undergraduate education on learning disabilities at the Cardiff School of Physiotherapy.

Case Study 8.1

Background

- Ian was a young man with profound and multiple disabilities.
- Ian had a moulded wheelchair insert, which was used mainly for transport, as he was

unable to tolerate the corrected position for long.

- Much of his time was spent in a fixed-height reclined armchair.
- Physically he presented with:
  - Gross kyphoscoliosis, concave to the left, compromising his left lung
  - There was severe impingement of his left pelvis under his rib cage
  - Both hips were windswept to the left
  - 19 years ago he had a right Girdlestone's operation and the position of the top of his right femur was undetermined, but was suspected to have migrated upwards and to be sitting somewhere posteriorly under his sacrum
  - Both upper limbs were held in flexion with a degree of external rotation
  - His head was held in fixed left rotation and some extension
  - He had poor head control
  - His lower limbs had minimal flexion at his hips and knees bilaterally
  - Ian had a body weight of 3½ stone (22 kg).

Transfer issues

- There was a report in Ian's physiotherapy and day service notes recommending that he was not to be transferred using a hoist as it could have a detrimental effect on his breathing.
- There was an additional statement from a consultant neurologist stating that a manual lift would be most appropriate due to Ian's spasticity levels.
- The existing handling plan stated that one person lifted Ian for all transfers.
- Carers were reporting that lifting Ian had become increasingly difficult, although the reasoning behind this was difficult to pinpoint.
- The handling plan was initially changed to a co-ordinated 2-person lift while assessment was undertaken to define the types of specialist slings appropriate for Ian's needs.

Problems identified with the standard slings

- Ian's trunk was insufficiently supported, as the lifting points on conventional slings are at hip and shoulder level, which encouraged too much flexion at his hips for him to tolerate, i.e. encouraged a 'jack-knife' position.
- Due to the 'closed' position of conventional slings and the fact Ian's head was fixed in left rotation, his nose was compressed against the sling, preventing him from breathing.
- Insufficient head support.

Assessment for a specialist sling

- It was thought that the statements in Ian's records regarding the hoisting may have

stemmed from the early days of hoist transfers when all slings were the same design and probably were unsuitable.

- Specialist slings were required that had the following characteristics:
  - A more open position that would not compromise Ian's hips.
  - Increased lifting points, at shoulder, hip and thigh level, to provide increased support for Ian's whole body in a reclined position.
  - Separate supports at each thigh to accommodate the different thigh lengths and hip pathology.
  - That enabled Ian to continue to breathe nasally during a transfer, i.e. had a hole level with his nose that would also provide some head support.
  - Stretcher spreader bar to support Ian in his preferred lying position.

Introduction of hoisting

- The carers were initially reluctant to assist Ian with transfers using a hoist because of the well established myth that Ian could not be hoisted.
- The specialist sling was trialled initially by a physiotherapist and 2 manual handling advisors in order to determine the effect on Ian's breathing and pain levels by observing his facial expression.

Outcomes

- Use of the hoist and specialist sling was successfully trialled, gradually incorporating the carers into its use.
- Written instructions and photographs were provided for the carers to assist them with the positioning of Ian in the sling and where to attach the loops of the sling onto the spreader bar.
- Despite the initial reluctance Ian's carers were able to observe the hoisting process and became convinced that they could continue this as the method of choice when transferring Ian.

Case Study 8.2

Background

- Mary is a 48-year-old female who has cerebral palsy and LD.
- She lives in 24-hour-staffed accommodation.
- She has no verbal speech and uses Signalong for communication.
- Mary is wheelchair-dependent and requires hoist transfers at all times.

- She has fixed flexion deformities of her hips and knees.
- Her knee position makes it difficult for her to keep her feet on ordinary footplates in her wheelchair.
- Mary has some functional movement of her upper limbs, which enables her to self-feed and hold a cup.
- She is unable to assist with dressing.
- Mary has a lot of extensor thrust, which she occasionally uses purposefully to reposition herself, but she also tends to use this as part of her unwanted behaviours.

Identified problems

- Mary spent a period of time in a nursing home following the death of her parents. During this time her weight increased as the staff used food to placate her.
- Added to this was increasing frustration at her isolation.
- Her posture within her wheelchair had deteriorated quite dramatically.
- These issues could not be resolved until she moved into staffed accommodation; even then they took some time to be resolved due to the waiting list for the wheelchair service provided by occupational therapy.
- Mary's challenging behaviour manifested itself in episodes of crying and then screaming.
- The volume and intensity is such that she can be heard outside the house quite easily.
- She is inclined to pinch and grab at anyone close to her.
- In addition she tends to use the extensor thrust, which in the past has resulted in her sliding out of her wheelchair. The lap strap on her wheelchair has been changed so that she is unable to undo it herself.
- Staff have to use a ballpoint pen to release the clip.

Treatment strategies

- Staff within the supported accommodation were intensively trained along with Mary in Signalong, as some of the signs that she had previously used were unique to her and her family and their details had been lost on the death of her parents.
- This side-by-side learning helped to alleviate the communication difficulties for the staff needing to know what Mary was asking them.

Therapy

- Initially when she moved into the staff accommodation her behaviours were centred around her wheelchair, as she was clearly uncomfortable and at that time had no alternative seating.
- When she became uncomfortable or tired she was obliged to either go to bed or stay in the wheelchair and sit in the lounge.

- Mary's attendance at activities or therapy, which included hydrotherapy and rebound, was mood-dependent.
- She was provided with an All-day sling to help with the repositioning in her wheelchair.
- This reduced the amount of general manual handling as her lack of trunk flexion made placing a sling behind her very difficult.
- In addition, the provision of the All-day sling minimised the risk of Mary being able to pinch staff during transfers.
- The LD physiotherapist assessed Mary for alternative seating and a postural armchair was provided, meaning that she had a suitable alternative and comfortable seat, which could be moved from room to room.
- Despite the changes Mary continued to have regular bouts of crying and screaming, which meant staff were unable to interpret her requests.
- At these times Mary was given the option to stop or be removed to her bedroom.

Ongoing physiotherapy input

- This will continue to be ongoing in weekly rebound therapy and hydrotherapy sessions as her moods allow.
- There will be regular review of Mary's wheelchair and general postural management. Support will be provided for home staff who may require further advice on manual handling or other issues.

Case Study 8.3

Background

- Sandra is a 23-year-old woman with athetoid cerebral palsy.
- She weighs 5½ stone (34 kg).
- Sandra has no verbal communication, but has very expressive facial expressions and can indicate pain or pleasure.
- She lives in supported accommodation with 24-hour support and attends Day Services 5 days a week.
- Physically she does not have any spinal deformity, but presents with typical athetoid movements of both upper and lower limbs.
- Tonally, she fluctuates between high and low tone.
- Her joints are generally lax.
- Sandra used an adapted wheelchair with thoracic supports.
- There was a chest harness provided to further support her trunk in an upright posture, a pelvic strap to maintain her pelvic position and foot straps on the wheelchair footplates to minimise lower limb extension, which led to global extension if her feet were left free

and unrestricted.
- Sandra had uncontrolled epilepsy and required rescue medication in the form of rectal diazepam at the onset of any seizures in order to prevent status epilepticus.
- Her typical seizures were tonic-clonic.

Risk assessment

- It was necessary to have a clear understanding of what happened when Sandra experienced a seizure in order to devise a management plan to enable her safe removal from her wheelchair to facilitate the administering of the rescue medication.
- During a seizure her body was described as going into global extension, being strong enough to potentially lead to a fracture or dislocation of her lower limb joints, due to her being fixed in the wheelchair with straps.

Reasoning

- A hoist transfer was not considered an option as she may have incurred an injury by impacting against the body of the hoist.
- In addition, because the rescue medication was required at onset of seizure, it was thought to be unlikely that a hoist would be immediately at hand to assist her from her wheelchair.
- The consensus view was that Sandra would need to be physically lifted from her wheelchair due to the life-threatening nature of the situation despite manual handling guidance that individuals are not to be routinely lifted.
- A multiprofessional meeting was held with the health team including the prescribing consultant and Sandra's father in order to consider the issues presented by the recommendation to carry out a physical lift.

Process

- In order to reduce the risk associated with lifting Sandra a specialist all-day sling was commissioned. This had strategically placed 'carry handles' at shoulder and hip level.
- It was left in situ behind Sandra in her wheelchair, so it would be available in an emergency as well as for other transfers.
- The sling incorporated a strap around her trunk in order to ensure that it would remain close to Sandra during any lift.
- A specific order was defined for the release of the wheelchair chest harness, pelvic strap and foot straps.
- In the event of the foot straps being released first, Sandra would go straight into extension, which would prevent the release of the pelvic strap.
- Photographs were taken of each stage of the lift, including positioning of the carers,

release of the straps and hand placements on the sling.
- This was reinforced by simple written instructions covering each stage of the process.
- The material was developed as training material, so the carers could refer to it on a regular basis if Sandra went for a prolonged period without having a seizure.

Outcomes

- The risk assessors who devised the plan were informed on each occasion that Sandra had a seizure.
- This was to enable evaluation of the process and amend it if required.
- The plan was carried out successfully on a number of occasions and neither Sandra nor any of her carers sustained any injuries during its implementation.

Addendum

- Sandra underwent a percutaneous endoscopic gastronomy (PEG) for eating and drinking difficulties and following this her seizures became more controlled.
- In addition buccal midazolam was introduced as an alternative rescue medication, which did not require Sandra to be removed from her wheelchair for the administration.

Chapter 8 Learning disabilities multiple choice questions

1. What are the criteria for someone to be labelled 'learning disabled'?
   a). Unable to achieve 5 GCSEs
   b). Dyslexic
   c). IQ below 70, unable to carry out aspects of daily living independently
   d). Acquired brain injury affecting all aspects of daily living
2. Which of the following pieces of legislation will benefit individuals with LD least?
   a). The Mental Health Act 2007
   b). The Mental Capacity Act 2005
   c). The Disability Discrimination Act 1995
   d). Carers and Disabled Children's Act 2000
3. What does MDT stand for?
   a). Mechanical delay transfer
   b). Mental deficiency treatment
   c). A common term for manic depressive treatment
   d). Multidisciplinary team
4. When delegating a physiotherapy task to carers, you should gain the consent of:
   a). The client's parents
   b). The carers and the client's family members
   c). The client and all carers who will be undertaking the programme
   d). Members of the MDT

5. What does MCA stand for?
   a). Medical crisis alert
   b). Mental Capacity Act
   c). Medical Compliance Act
   d). Movement criteria assessment
6. Under what circumstances should a 'best interests meeting' be held?
   a). When family and carers are unable to agree on a plan of action
   b). When the professionals involved are unable to reach a consensus
   c). When the individual does not have the capacity to decide major life decisions for themselves
   d). When the individual is confused about a decision
7. What does SOVA stand for?
   a). Safeguarding of vulnerable adults
   b). Safeguarding of violence and aggression
   c). Social outcomes values approach
   d). Safety of vehicle analysis
8. What type of hoist and sling might you consider recommending for an individual who is wheelchair-dependent, requires physical assistance for all transfers, and is able to weight bear?
   a). Hoist and full sling
   b). Hoist and dress sling
   c). Standing hoist
   d). Ceiling tracking hoist
9. What type of hoist and sling might you consider recommending for an individual who is wheelchair-dependent with a moulded insert, windswept deformity of the hips and fixed kyphoscoliosis?
   a). Hoist and specialist sling
   b). Standing hoist
   c). Hoist and dress sling
   d). Poolside hoist
10. What does PMLD refer to?
    a). Profound and multiple learning disability
    b). Postural management for people with learning disability
    c). People with multiple learning disabilities
    d). Profound movement and limb disorder
11. What is a disorder of swallowing?
    a). Dysarthria
    b). Dysphasia
    c). Dystonia
    d). Dysphagia
12. What chromosome is affected in Down's syndrome?
    a). 29

b). 26
c). 21
d). 31

13. What problems do individuals with Prader–Willi syndrome experience?
a). Climbing stairs
b). Negotiating obstacles within a home environment
c). Difficulties with spatial awareness
d). Difficulties in controlling food intake

14. What does the term postural management mean?
a). Assisting an individual to maintain an optimum posture over a 24-hour period
b). Use of a straitjacket for periods of time during every day
c). Ensuring an individual sits appropriately
d). Providing equipment to assist an individual to sleep in an optimum position

15. Who is responsible for ensuring an individual has appropriate wheelchair seating?
a). Carers
b). The physiotherapist in isolation
c). The occupational therapist in isolation
d). Liaison between the physiotherapist, occupational therapist, wheelchair services and seating engineer

16. What is the difference between an OT and a physiotherapist?
a). One wears bottle green and one wears navy uniform
b). One does crafts and the other does sports
c). Physiotherapists regain range of movement and muscle power and OTs use this to regain purposeful function
d). One does manipulation and the other issues equipment

17. Why were the long-stay institutions closed?
a). Expense
b). Socially unacceptable
c). People have the right to live a normal life
d). The land was needed for houses

18. What reasons can an individual not access a hydrotherapy pool?
a). Double incontinence
b). PEG
c). Epilepsy
d). Open wound

19. What's pica?
a). Compulsive habit for eating anything
b). People in community accommodation
c). Profoundly independent challenging adults
d). Chromosomal disorder affecting chromosome 7

20. What does LOLER stand for?
a). Limitations of lifelong epilepsy risks

b). Lifting Operations and Lifting Equipment Regulations
c). Lots of little endemic rituals
d). Lifting of Large Equipment Regulations

Learning disabilities multiple choice answers

1. c)
2. d)
3. d)
4. c)
5. b)
6. c)
7. a)
8. c)
9. a)
10. a)
11. d)
12. c)
13. d)
14. a)
15. d)
16. c)
17. c)
18. d)
19. a)
20. b)

Chapter 9

Medicine

Introduction

- The prospect of undertaking a medical placement or rotation within an acute hospital trust can fill a student or band 5 (newly qualified or not) with either a sense of trepidation or excitement.
- Medicine tends to be a placement or rotation that is not considered by many students or graduates to be 'desirable', unlike outpatients, ITU or paediatrics for example.
- What is involved in working in medicine tends to be poorly understood by both students and graduates alike.
- Medicine is a diverse speciality where physiotherapy can really make a difference to patients' independence and the overall quality of their lives.
- From a professional and developmental perspective medicine can provide an environment where fundamental knowledge and skills can be acquired which will be valuable and applicable to all other areas of physiotherapy practice, that are likely to be encountered throughout a professional career.
- The most likely location of a medical rotation is within an acute hospital trust, the size of which can be variable.
- It is realistic to say that a band 5 will be responsible for more than one medical ward, and students may also find that they have patients dispersed over a number of wards.
- Medical wards may encompass any number of beds from 20 upwards.
- There has been an increase in average age of the population in recent years and this poses increasing challenges for clinical staff working in the area of medicine when it comes to providing safe and effective management of their patients.
- There have been rising numbers of admissions and the associated demand for beds has often been accompanied by a reduction in the number of acute beds that are available as a result of efficiency cuts in budgets.
- Many of these changes have followed the introduction of government policies and it is these policies that have provided the drivers for the production of clinical guidelines (DOH 2010, NHS 2000, Reeves et al, 2003).
- The Department of Health white paper: 'Equity and Excellence: Liberating the NHS' (2010) outlines the future of the NHS, with Government recommendations suggesting reforms that are both challenging and far-reaching in terms of the cultural changes that they will bring about in the NHS (DOH 2010).
- The proposal is for the NHS to release up to £20 billion through efficiency savings, which will be reinvested to support improvements in quality of care, clinical outcomes and to

provide a coherent, stable, enduring framework for quality and service improvement (DOH 2010).

- It is realistic to view the proposals as being the most significant and radical changes in the NHS in recent times that may change physiotherapy practice beyond recognition and will impact on the delivery of physiotherapy in the medicine setting (Dixon and Ham 2010).

Conditions encountered in medicine

- All patients will be under the care of a consultant-led medical team for the duration of their admission in hospital.
- The conditions and pathologies that will be encountered within the speciality of medicine either as a presenting condition (PC) or past medical history (PMH) are diverse.
- It is not possible to cover these in depth in this volume, therefore a list of examples is provided to indicate the variety of conditions and experiences associated with medicine (Table 9.1).
- It is essential to have some knowledge of the condition a patient is presenting with and/or the patient's past medical history in order to perceive the patient holistically.

Table 9.1 Specialist areas of practice and common conditions associated with medicine

Cardiology	Acute coronary syndrome (ACS) Angina AF (atrial fibrillation) MI (myocardial infarction) CCF (congestive cardiac failure)
Respiratory	Chronic obstructive pulmonary disease (COPD) Asthma Emphysema Pulmonary embolism Tuberculosis (TB) Upper or lower respiratory tract infections (URTI/LRTI) Pleurisy Hospital- or community-acquired pneumonia (HAP/CAP) Bronchitis Bronchiectasis

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Neurology	Stroke Head injuries Multiple sclerosis Parkinson's disease Guillian–Barré Transient ischaemic attack (TIA) Dementia Alzheimer's disease
Vascular	Peripheral vascular disease Amputees Intermittent claudication Deep vein thrombosis (DVT)
Metabolic	Diabetes
Urinary	Urinary tract infections (UTI) Kidney infections Incontinence/behaviour change/acute confusion
Oncology	Any current or previous presentation/history of cancer
Cellulitis	Pain; decreased mobility/function; infection
Falls	Could be due to any of the above; decreased mobility or function; drug management

The role of the physiotherapist and the multidisciplinary team (MDT)

- It is equally important to recognise the role of the physiotherapist during the patient's period of hospital admission.
- The process by which a patient is referred into the physiotherapy service will vary, depending on the system of preference within an individual hospital.
- Some units may operate a 'blanket referral' policy, where every patient on a particular ward has their physiotherapy needs assessed.
- Other organisations may operate a 'nurse-led' referral system, resulting in the nursing staff being able to refer patients to the ward physiotherapy service on an as-required basis.

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- Some may follow the more historical system where only members of the consultant team are able to complete a referral, i.e. house officer (HO), senior house officer (SHO), registrar (Reg), senior registrar (Sen Reg) or the consultant themselves.
- Alternatively a service may operate a mix and match of any of the above referral processes.
- MDT working is covered during the training of physiotherapy students in the university setting where it may seem to be a rather abstract concept in many instances.
- It is during placements or rotations that multiprofessional practice is placed into context.
- It is in clinical practice where MDT working can be seen to facilitate the efficient and effective management of patients, ensuring discharge from hospital occurs in the shortest possible time.
- During a medical placement/rotation the other members of the MDT that will come into contact with physiotherapists are; occupational therapists (OT), speech and language therapists (SALT), social workers (SW), dieticians, pharmacists, specialist nurses with an interest in chronic obstructive pulmonary disease, tissue viability, multiple sclerosis or Parkinson's disease.
- In the author's experience the use of a physiotherapy ward book can be an effective and informative method of keeping a record of the patients that have been referred into the service and can include specific information about when they have been seen or not and also highlight those that are deemed to be too ill for intervention.
- Ward books also offer an 'at a glance' view of the workload that includes the case mix, overall numbers of patients and levels of dependency.
- They can be found along with other medical records on the ward or in a designated physiotherapy area.
- Medical wards can be incredibly busy, therefore it is essential that ward physiotherapists remain aware of what patients are currently under their care, that they are confident when prioritising their workload, are clear about when patients were last seen and that they ensure timely intervention.
- If patients are not on the ward, as anticipated, the reason for this needs to be discovered, e.g. a patient may have been transferred to another ward or specialty, they may have been discharged or have self discharged or no longer require treatment, e.g. the patient has died.

Prioritisation

- With the rising pressure to provide efficient services in health and social care the assessment and subsequent prioritisation of the patient care is imperative to ensure that they receive appropriate physiotherapy intervention in a timely and appropriate manner, according to their care needs and also in relation to their discharge plan.
- The workload tends to be much more variable on a medical ward than, for example, the predictable flow of patients every 20 or 30 minutes as experienced by physiotherapists in the outpatient setting.

- It is important to be able to manage time effectively in order that patients are appropriately assessed, that the physiotherapy interventions are defined for their particular needs and delivered in the appropriate time frame on any particular day.
- To be able to achieve this it is essential that the physiotherapist is able to prioritise their workload; if this is not done the patients will not be managed in the most efficient manner and will spend longer in hospital, further increasing pressure on beds.
- Prioritisation is a skill that needs to be developed.
- The physiotherapist needs to have an in-depth understanding of the presenting condition (PC), PMH and the associated risks of not seeing a patient within a desired time frame, if they are to manage their patients effectively and efficiently.
- In some organisations there may be a generic in-patient prioritisation document or process that will have been designed to assist physiotherapists in being able to identify high, medium and low priority, which is the equivalent of the 'must, should and could' process used in many musculoskeletal outpatient departments.

Delegation

- Another important skill that physiotherapists need to become proficient at alongside of prioritisation is that of delegation.
- One of the most valuable members of the medical team is the physiotherapy assistant, who provides clinical support for the physiotherapist.
- They may assist the physiotherapist with patients that require the assistance of two or more staff to enable a treatment to be implemented safely and effectively.
- Assistants are also able to complete patient treatment inventions as directed by the physiotherapist, as long as they have been deemed to be confident and competent to do so and the task remains within the assistants' professional scope of practice.

Seeking help

- It is important to highlight that if a student, or band 5 physiotherapist experiences difficulties with the management of their workload, or there is uncertainty about how to prioritise the patients on a daily basis, that these concerns are shared with a supervisor or more senior clinician working in the area.
- This is essential to ensure that patients receive the appropriate level of intervention and the advising clinician should be able to offer advice, help devise strategies about how to approach the work or propose joint working sessions to help build confidence and show the practical application of prioritising workload in the practice area.

Assessment

- As with most physiotherapy assessments there are subjective and objective components to be completed.
- Patient information can be gathered from many sources on the wards, with medical, nursing and other professions, documentation being resources that can be accessed to assist the physiotherapist in the compilation of the subjective assessment, enabling a detailed picture to be developed of each patient referred for physiotherapy.
- In some hospitals multi-professional notes may be in operation, these are designed to reduce the amount of duplication of notes or repeated questioning of patients that may often occur.
- Before commencing a face-to-face assessment the physiotherapist will need to collect a significant amount of information.
- It is important to read and digest the pertinent issues from the medical notes, i.e. history of present condition (HPC)/past medical history (PMH)/drug history (DH)/social history (SH), and differential diagnosis.
- It is also useful to refer to information about medical investigations.
- The information from the notes will assist professional clinical reasoning and the physiotherapist to establish a clinical picture of each patient and their potential needs before a face-to-face meeting.
- Commonly encountered medical investigations, their findings and their relevance to physiotherapy assessment are covered in the following sections.

Inflammatory markers

- On admission a patient may routinely have a full blood screen.
- An element of this investigation is looking at any changes in a patient's inflammatory markers (Table 9.2).

Table 9.2 Inflammatory markers illustrating normal and clinically significant values

White cell count (WCC)	Normal range: 4–11 × 10^9/L (4,000–11,000 per cubic millimetre of blood)
Erythrocyte sedimentation rate (ESR)	Normal range: Men 12–19 mm/h Women 18–23 mm/h (within age range 20–90 years)

C reactive protein (CRP)	Normal level: 10 mg/L Significant bacterial infection or acute inflammation: 40–200 mg/L Serious bacterial infection: 300 mg/L or higher (Randox 2011)

C reactive protein (CRP) levels

- CRP is a plasma protein and increase in levels of this in the blood can be detected within 6 hours, with a final level being as much as 60 times normal levels.
- Raised levels of CRP are unequivocal evidence of inflammation (Randox website).
- Inflammation is the body's response to injury and the infection detected may be acute or chronic.

Cardiac inflammatory markers

- From a cardiac perspective it is important to consider the specific blood tests that can be completed. When a patient is admitted to an accident and emergency department (A&E) or a step down equivalent with chest pain and a suspected myocardial infarction (MI) there are a number of investigations that may be carried out.
- Results from an ECG may be combined with results from blood tests and viewed in the context of the patient's presenting signs and symptoms and their PMH.
- An MI is major trauma to the cardiac muscle which will subsequently result in inflammation of the cardiac muscle to a varying degree depending on the severity of the infarction.
- This trauma and inflammation releases cardiac-specific enzymes, namely Troponin-T and Troponin-I.
- Troponin is a complex of three regular proteins that are integral to muscle contraction in skeletal and cardiac muscle but are not found in smooth muscle. The presence of troponin is used as an indicator for several heart disorders including MI. The subtypes Troponin-T and -I are specific indicators of damage to the myocardium.

Identifying the presence of infection

- When establishing if the cause of a patient's presenting condition is an infection, then investigating if any of their inflammatory markers are raised can confirm this as being one of the pieces of their clinical jigsaw puzzle.
- If one or all are raised this would suggest that a patient has an infection, the next step is to establish the cause.
- If considering a suspected respiratory infection a link could be made between the patient's signs and symptoms, arterial blood gas (ABGs) results, acid–base balance, X-ray findings and sputum sample results.

- Similarly if considering a urinary tract infection (UTI) the presenting signs and symptoms are important in the formation of a diagnosis in combination with urinalysis.

Conclusion

- There is no one specific investigation or symptom that will be viewed as being definitive of a diagnosis in isolation.
- The whole picture of a patient's presentation will gradually come together following the completion of a full medical assessment.
- In many instances the information that a physiotherapist establishes during an assessment can further support and assist the medical teams with their ongoing treatment and management of individual patients and their presenting condition while the patient remains in hospital.

Subjective assessment

- Although there is a certain amount of information that may have been extrapolated by the medical team or nursing staff there may be some additional physiotherapy-specific details that may need to be acquired from either the patient themselves or from their relatives and/or carers.
- Being in possession of an accurate social history is critical to physiotherapists assisting the patient with appropriate goal formulation and discharge planning.
- Social history (SH) relates to all the day-to-day aspects of independence, for example occupation present or previous, levels of indoor/outdoor mobility and endurance; aids required, washing and dressing, cooking, housework, hobbies, dependents, pets.
- Not only is it essential to document all the aspects of SH it is even more essential to be able to plot and identify changes within an individual's SH, especially if these changes can be correlated with episodes of illness, admissions to hospital or simply the natural progression of a long-term condition, e.g. COPD.
- A further vital piece of SH is identifying the type of accommodation that a patient has been admitted from. For example, has a patient been admitted from home, where they live independently and are normally able to manage stairs, or have they been admitted from a nursing home, where they require assistance with transfers, use a hoist and are only able to mobilise a few metres using a Zimmer frame and the assistance of two members of staff.
- It is important that the baseline of ability is identified as soon after admission as is possible.
- Another important consideration is the potential for the hospital environment to actually disable people.
  - The author recalls a patient who was admitted with a UTI to an acute medical ward from their own home, where she lived independently.

- In hospital the bed was a different height to the patient's bed at home and the patient had not been admitted with her sliding board.
  - This meant she was unable to transfer independently and mobilise in her wheelchair, which caused a great deal of frustration and the loss of dignity for that patient, who understandably was desperate to be discharged home simply in order to regain her independence.
- The process of discharge planning begins from the time of hospital admission and requires discussions to take place between health professionals on a regular and frequent basis to consider changes in the patient's condition and progression in respect of interventions.
- There are certain aspects of a patient's discharge that can be proactively planned for, e.g. if a patient has reported a long history of falls, then referral to a falls clinic can be organised along with support at home on discharge provided by an intermediate care team to include falls prevention training within the patient's own home.
- A patient with COPD can be referred to pulmonary rehabilitation or input from a COPD specialist nurse.

Objective assessment

Observation

- Observations include medical observations; blood pressure (BP); respiratory rate (RR); heart rate (HR); temperature, oxygen saturation (SaO_2); which are normally recorded by the nursing team and documented on the patient's observation chart and importantly what can be seen when the physiotherapist visits the patient.
- The following observations can be made:
  - Is the patient alert?
  - Are they talking to patients in neighbouring beds or to themselves?
  - Are they breathing regularly or short of breath?
  - Are they spontaneously moving in the chair or bed?
  - What is their colour like? Pale; flushed?
  - What is their posture in bed or in a chair?
  - Are they wearing glasses and/or hearing aid?
  - Do they appear aware of their environment/surroundings?
  - Are there any walking aids nearby – NB need to check any aids belong to the patient they are next to.

Consent

- There are fundamental components of an objective assessment that are applicable to

patients on a medical ward, irrespective of the reason for admission to hospital.

- Prior to any form of patient assessment it is essential that consent is gained from the patient (CSP 2004).
- Patient consent, whether it is written or verbal, needs to be obtained prior to any element of assessment or treatment. It is prudent to record that this has occurred within professional documentation.
- Similarly it is imperative that the patient's consent is obtained prior to discussing any aspect of their assessment findings or care plan with a next of kin, relative or carer.

Muscle strength

- Upper limb and lower limb muscle groups, using the Oxford Scale grading 0–5.
- Comparison of the patient's left side against their right.

Joint range of movement

- To include any specific joints involved in their presentation and the functional joints in the upper and lower limb, i.e. hip, knee, shoulder and wrist comparing the right and left.

Sensation

- Generic assessment of both sides of the body should note the intact areas and identify patchy sensation or specific areas where sensation changes have occurred.
- The findings may indicate where the patient's skin integrity may be at risk.

Current mobility and functional level

- This needs to be benchmarked against the patient's pre-admission status.
- The assessment should include bed mobility; transfers; mobility indoors and outdoors.
- This may involve liaison with the OTs regarding personal activities of daily living (PADL) and domestic activities of daily living (DADL).

Stairs assessment

- If the patient has stairs at home then this will need to be included in the assessment.
- It will need to be determined if the patient is able to ascend and descend stairs and also if they are safe to do so.
- The need for aids or the addition of stair rails or a supplementary banister will need to be considered.

Current endurance and fitness level compared to preadmission status

- When synthesising this information the question needs to be asked whether the objective outcomes assessed reflect the condition of the patient when they were at home.
- Did these contribute to the problem or did they impact on each other, e.g. if a patient has decreased ROM in the knee joint and has decreased muscle strength could these be contributing factors in the patient's declining levels of mobility and the occurrence of falls at home?

Speciality-specific objective assessments

- In addition to the generic components of the objective assessment highlighted above there are more specific assessments that will need to be completed, that depend on the reason for admission and/or the patient's past medical history.
- The two specific objective assessment approaches that are used in medicine tend to have a cardiorespiratory and neurological basis.

Cardiorespiratory assessment

- Breathing pattern.
- Is there obvious accessory muscle contraction?
  - Is the patient demonstrating increased work of breathing?
  - Is it possible to observe pursed lip breathing?
  - Does the patient demonstrate shortness of breath at rest?
- Palpation
  - Is the chest expanding equally on both sides?
  - Can sputum crackles be felt?
- Auscultation
  - Identification of abnormal breath sounds and/or added sounds
  - Are breath sounds audible throughout the lung fields?
  - Are the breath sounds normal, abnormal or diminished (Hough 2001)?
  - Are there added sounds?
  - Can crackles be heard? That could indicate the presence of unwanted secretions
  - When are the crackles heard? early, mid or late inspiration?
  - Are inspiratory or expiratory wheezes present?
  - Expiratory wheeze with a prolonged period of expiration can be caused by bronchospasm, whereas an inspiratory and expiratory wheeze can occur as the result of there being an obstruction in the airways
  - Pleural rub may occur when the patient has pleurisy, which is an inflammation of

the pleural surface
  - Pleural rub can sound like crunching on snow and is best auscultated over the lower lung fields (Hough 2001).
- Sputum or increased levels of secretions
  - Colour and consistency.
- Mucus or pulmonary oedema
  - Is there blood present indicating haemoptysis? And does this link with any PMH or with the current diagnosis?

Investigations to aid assessment

- Sputum specimen analysis will assist in the identification of the pathogen responsible for the infection (Hough 2001).
- Chest X-ray (CXR) can identify issues such as fluid levels or consolidation of specific areas of the lungs.
- Bloods samples can indicate the presence of underlying pathology, e.g. inflammatory markers.
- Arterial blood gases (ABGs)

Normal values:

PaO_2: 11–14 kPa (80–100 mmHg)

SaO_2: 95–98%

$PaCO_2$: 4.7–6.0 kPa (35–45 mmHg)

Acid–base balance:

pH: 7.35–7.45

HCO_3 (bicarbonate levels):

normal 22–26 mmol/L

Metabolic acidosis:

<22 mmol/L

Metabolic alkalosis:

>26 mmol/L

Base excess

Normal: minus 2 to plus 2 mmol/L

Metabolic acidosis: <-2 mmol/L

Metabolic alkalosis: >2 mmol/L (Hough, 2001).

Neurological assessment

- Assessment will include the following areas:
  - Movement which will pay particular attention to the quality of movement
  - Tone

  - Rigidity
  - Sensation
  - Co-ordination
  - Proprioception
  - Neglect
  - Communication
  - Postural assessment.
- The assessment of swallowing and speech is not within a physiotherapist's scope of practice.
- However, if a physiotherapist has concerns or is aware that a patient is having difficulties managing their secretions and therefore may be at risk of aspirating then it is essential that the respiratory status is assessed and regularly reviewed.
- With regards to communication a physiotherapist can liaise with the SALT team for specific intervention to improve the patient's ability to communicate.

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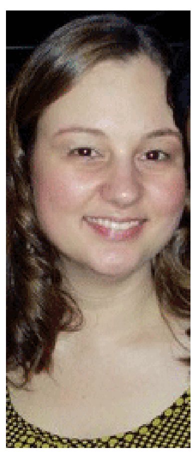
Chapter 9

E-materials

Author profiles

Beverley Greensitt BSc(Hons) MCSP

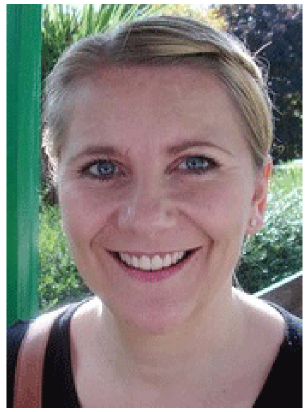
Bev qualified from King's College London in 2004 and following this she has completed a broad range of rotations as a band 5. She has been working as a senior clinician in Acute General Medicine. Whilst working in medicine Bev has developed a portfolio of experience working on Gerontology wards, day hospitals, providing MDT management and rehabilitation to elderly patients. Bev has particular interests in providing clinical education for students and educating about and promoting the role of physiotherapy and rehabilitation in an MDT setting. Bev has found that contributing to the medicine chapters and material has provided an opportunity to clarify the types of experiences encountered and the skills necessary for working in a medicine environment.



Clare Nickols MSc BSc(Hons) MCSP

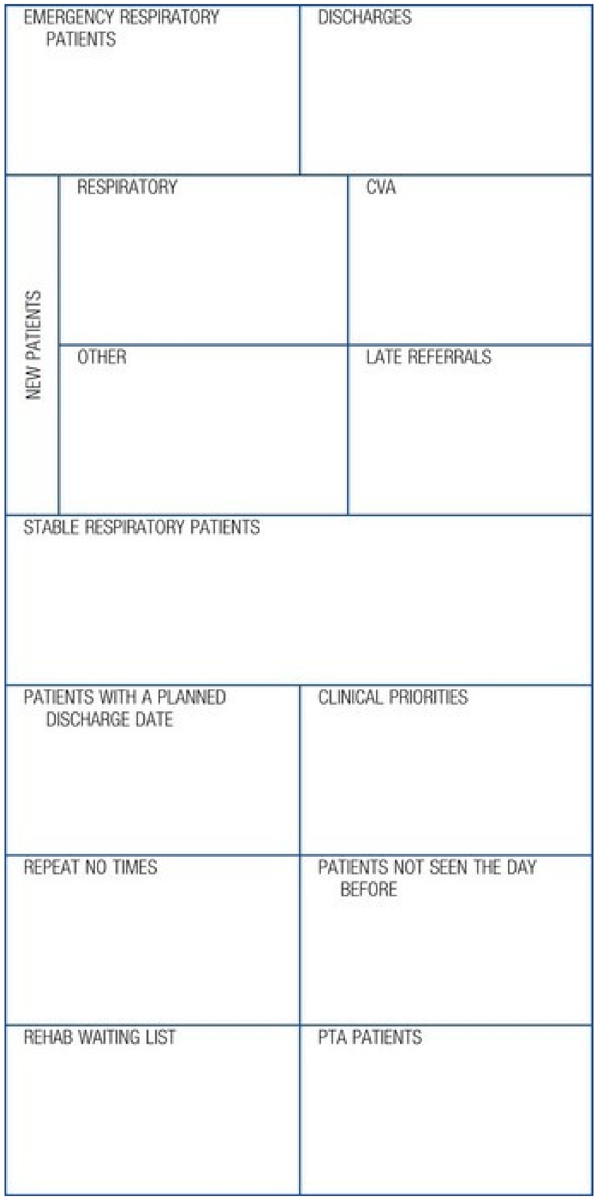
Clare Nickols qualified from The University of East London in 1996 and completed her junior rotations at The Homerton Hospital in Hackney. Clare then worked at The Royal Hospital for Neuro-disability in Putney for 3 years. She specialised in the rehabilitation of people who have acquired complex brain injuries and challenging behaviour. Clare is currently the In-

patient Services Team Leader and Deputy Physiotherapy Manager at Heatherwood Hospital in Ascot. She achieved a distinction in the Masters in Rehabilitation at Oxford Brookes University in 2007.



Appendix 9.1

Daily prioritisation sheet



Guidelines for prioritisation sheet

For any patient you go and see, remember to write your name against the patient's name.

Emergency respiratory

- Patients who are very sick and require immediate respiratory physiotherapy. For example, those patients you would see in an on-call situation.

Discharges

- Patients who require assessment for discharge.
- Patients who you are seeing who have reached their premorbid level of function and can therefore be discharged from your list.

New patients

- Respiratory – must be seen on the day of referral.
- CVA – must be seen with 72 hours from the onset of their stroke.
- Other – e.g. mobility referrals. Must be seen within 48 hours of referral.

Late referrals

- These are mobility referrals that are given during the day, i.e. not at handover.

Stable respiratory

- Patients who do not require intensive respiratory physiotherapy, e.g. those patients on 2–3 l O_2.

Patients with planned discharge date

- Patients where the plan is to get them straight home, i.e. not for rehab. With these individuals they should be seen daily so they get more input and then you may decide to hand them over to a PTA to maintain their mobility whilst they are awaiting discharge, e.g. for care package.

Clinical priorities

- For example, patients who may need a week of daily input to determine their discharge destination.

Patients that were not seen the day before

- Any patient who did not receive treatment the day before.

Patients on a list for further rehabilitation

- Patients who are on a waiting list for further rehabilitation (CH/ICB). You may decide to alternate these patients between this category and the no times box if you are particularly busy.

PTA patients

- Patients for maintenance work, progression of mobility, passive stretches. These patients MUST be given sit to stand programme and strengthening or balance exercises (this is more important than mobility practice).
- For patients who are doubles, PTAs can go through bed or chair exercises with the patients.

Physiotherapy assistant priorition sheet

PHYSIOTHERAPY DOUBLES	NEW PATIENTS
DISCHARGES	PATIENTS WITH PLANNED DISCHARGE DATE
PATIENTS NOT SEEN THE DAY BEFORE	PATIENTS ON A REHAB WAITING LIST

Guidelines for physiotherapy assistant prioritisation sheet

Physiotherapy doubles

- Patients requiring two or more people to treat them.

New patients

- New patients handed over from the physiotherapist.

Discharges

- Patients for discharge that day.
- Patients who have reached their required level of function and can be discharged from the caseload.

Patients with a planned discharge date

- Patients who require intensive input and therefore must be seen daily in order for them to return home.

Patients not seen the day before

- Any patient who did not receive treatment the day before.

Patients on a rehab waiting list

- Patients awaiting rehab at either a community hospital or ICB. These patients must have been given a sit to stand programme and strengthening or balance exercises. This MUST be carried out prior to any mobility practice.

Case Study 9.1

Background

- 54-year-old woman.
- Previously fit and well.
- Lived alone.
- Independent with all ADLs.

PMH

- Hypertension.

HPC

- Transferred to an acute general medicine ward from the neurosurgical unit after having a Grade V subarachnoid haemorrhage 2 months previously.

- The patient had been assessed and treated by a rotational band 5 on the ward.
- During this time the patient developed diarrhoea and was unable to sit out in the cirrus chair provided by the OT.
- A stretching programme was devised for the PTA to carry out during the period of bed rest and this was continued for 7 weeks.
- Once the patient's diarrhoea had stopped, they were able to start sitting out again.
- A joint assessment was carried out with the OT to ensure that the seating remained appropriate in view of her not having been out of bed for 7 weeks.
- The medical team requested that the patient have intensive physiotherapy.
- The band 5 explained to the house officer that due to the size of her case load she had delegated treatment to the PTA who was carrying out a stretching programme. The band 5 discussed what was realistically possible in terms of physiotherapy input, which improved the understanding of the medical team in this case.
- Whilst carrying out the stretching programme, the PTA noticed that the patient's legs were becoming increasingly tight.
- The band 5 was informed who discussed the patient with a senior colleague.

Reassessment

- A joint assessment was carried out and the following noted:
  - Difficult to assess muscle power or sensation as the patient was unable to communicate.
  - Increased tone was present in right shoulder and elbow.
  - Full PROM in both ULs.
  - Increased tone in both legs; hip adductors, knee flexors and TAs.
  - Unable to achieve plantargrade in both ankles.
  - Patient required maximum assistance of 2 to roll.
  - Assistance of 2 required for her to move from lying to sitting and back to lying.
  - Full sling hoist required for all transfers.
  - Assistance of one required to maintain sitting balance.
  - Head held in a position of side flexion to the right.
  - Patient began to engage a little more once her head was brought into midline.
  - On discussion with the senior physiotherapist, the following plan was made to address the problems:
  - Patient to be seen twice a week by the band 5 physiotherapist, PTA to continue with the stretching programme.
  - T-roll to manage high tone in lower limbs. For 2 hours on, 2 hours off. Nursing staff informed.
  - Scotch and soft casts for TAs (casts made by plaster room). To start wearing for 2 hours per day for the first week and then increase by one hour per week. Chart with instructions placed above patient's bedspace. Nursing staff to check for pressure sores and to alert physiotherapist if any problems.

- Discussion with regional neuro-rehab unit for botox in view of spasticity in lower limbs.
- Liaise with OT re: head support for patient when sitting out in wheelchair and for footplate adjustment.

Outcomes

- Problems that arose were addressed as follows:
  - Twice weekly treatment: occasionally it was not possible, e.g. due to a sick respiratory patient, in which case the PTA continued with the stretching programme. Treatments consisted of the tilt table and sitting balance work. The PTA also incorporated functional tasks into the stretching programme, e.g. assisting the patient to comb her hair with her left hand.
  - T-roll: a chart with instructions was placed above the patient's bed which worked very well.
  - Splints: initially the casts worked well. After 3 weeks, the cast for the right leg had to be removed as the patient developed a pressure sore on the posterior aspect of her calf. ROM in her left ankle began to increase gradually.
  - The patient was reviewed by one of the consultants working in the neuro-rehab unit and deemed suitable for transfer to the unit. (Botox injections were given after transfer to the rehab unit.)
  - Discussion with the OT about head support. There was no other head rest available, therefore a temporary one was made by rolling up a towel and placing this at the side of the current head rest. Footplates were adjusted to ensure the optimum position for the ankles when the patient was in the chair.

Conclusions

- Patients like these ideally require daily physiotherapy as recommended by the CSP guidelines.
- In a busy acute general medicine ward it is not realistic to provide this, therefore it is preferable to do the following:
  - a). Discuss the case with your senior, assess the patient jointly and devise an efficient treatment and management plan.
  - b). Combine treatment sessions, e.g. tilt table with stretching programmes carried out by the PTAs.
  - c). Obtain further guidance from colleagues working in neuro-rehabilitation.
  - d). Discuss the issues with the medical team and agree realistic therapy interventions.
  - e). Liaise regularly with the OTs re: seating to meet patient's needs, or other professions to ensure the patient's needs are being met.
  - f). Document clearly in the notes the treatment plans and any splinting charts.

Case Study 9.2

Background

- 68-year-old female.
- Lives with husband.
- Dependent on husband for all ADLs, no formal POC.
- Mobilises with assistance of 1.
- Wheelchair for outdoor use.
- Normally PEG fed apart from 3 spoons of yoghurt a day to take medication.

PMH

- Progressive supranuclear palsy – 'Parkinson's Plus' syndrome.
- Corticobulbar disease.

HPC

- Patient was admitted to the intensive care unit with SOB and productive cough.
- GP had prescribed antibiotics, with no response.
- Chest X-ray revealed RLL pneumonia.
- Whilst the patient was on ITU she was treated with oxygen therapy (Vapotherm), cough assist, positioning and nasal suction.
- She was reviewed by the consultant neurologist and it was agreed between the ITU and neurology teams that the patient should not be intubated due to her comorbidities.
- 4 days later she was transferred to the acute general medical ward.

Assessment on the medical ward

- Initially she was on 28% heated humidified oxygen. SaO_2 94%.
- Auscultation revealed crackles in RMZ and bases with decreased AE in the bases.
- Patient's bed mobility was assessed and she was able to transfer into sitting with minimal assistance of two.
- She had independent sitting balance.

Treatment

- She was then transferred to a chair with assistance of 2.
- Once she was sitting out, the cough assist was used to mobilise the secretions and to

increase lung volumes. SaO_2 increased to 98%.

- Cough sounded productive, but nothing was expectorated.
- Patient declined nasal suction as her nose was sore from previous suction.
- She was treated again in the afternoon and her mobility assessed further.
- At this point her husband was present and because of the amount of equipment around the bedspace and the need for 2 people to treat the patient, the husband was asked if he would wait in the day room.
- The husband said he didn't mind waiting in the bedspace whilst we treated his wife. It was explained why it would be helpful if he waited in the day room.
- He reluctantly complied with the request, but was evidently not happy.
- Auscultation revealed same as a.m., with her breathing room air, SaO_2 93%.
- Sitting out in chair the cough assist was used, again the cough sounded productive, but nil cleared. The patient again declined NP suction.
- She was mobilised for 15 metres with the assistance of two. Oxygen levels were SaO_2 95% post treatment.
- Following the treatment the physiotherapist went to the day room to talk to the husband. He felt that he was not welcome and wanted to go home. The physiotherapist apologised that he had been made to feel like that and explained why he had been asked to leave, how well his wife had done in the treatment session and that he would be welcome to join them for tomorrow's treatment when he visited.
- The husband revealed that on the night his wife was admitted he was told that she may not make it and he remained extremely distressed and worried, even though she was progressing well. After having discussed this he apologised for his actions, thanked the physiotherapist for all the help and agreed to join the following day's treatment session.
- The next session was a repeat of the previous afternoon. She transferred with 1 and was mobilised for 25 metres with assistance of 2.
- The provision of a gutter frame was discussed, but the patient declined to use one as her previous experiences led to her mobility being hampered.
- The afternoon session was carried out jointly with her husband who demonstrated how he assisted her by walking behind her with his hands on her waist.
- He had been given a handling belt in the past but this hadn't worked as it slid up when mobilising the patient and the husband had concerns about dislodging the PEG tube.

Outcomes

- The patient was reviewed over the weekend by the respiratory weekend service as patient at risk of deteriorating, due to the ineffective cough, the presence of secretions and reduced lung volumes.
- After the weekend the patient's chest was much improved; there were no crackles and lung volumes had improved.
- The medical consultant requested that the patient have a gutter frame to mobilise despite

it being documented in the notes the previous week that she did not find this a helpful walking aid.
- The patient continued to be mobilised by the ward therapists and the patient's husband to build exercise tolerance and maintain lung volumes.
- She was discharged home the following day.

Conclusions

- Combination of respiratory, neuro and rehabilitation skills were required for the management of this patient.
- Effective communication skills were required for use with patient, husband and medical team.
- Conflict resolution skills were used when the husband became upset (ability to empathise, apologise and resolve problem).
- The husband's input was very important for determining how patient's current level of function compared with her preadmission function.

Case Study 9.3

HPC

- 66-year-old female, admitted after being found collapsed.
- Patient confused with reduced mobility.
- Treated 3 days previously for UTI.
- Incontinent of faeces and urine.

PMH

- Type 2 diabetes, controlled by insulin. Diabetes poorly controlled as patient lacked insight into problem.
- Schizophrenia, usually stable.
- Hypertension.
- Hypercholesterolaemia.
- Obese.

Social history

- Smoker (12 per day).
- No alcohol.

- QDS POC.
- 1 nurse for insulin daily.
- 1 nurse for meds.
- Independent with ADLs.
- Normally independently mobile, able to do stairs but slowly.
- Lives in upstairs flat. CPN (community psychiatric nurse) had been looking into a new placement as prior to admission patient's mobility had been deteriorating and patient had been having falls.
- Does own shopping.

CT head showed caudate infarct.

On the evening of the day of the admission, patient began to deteriorate as identified by the track and trigger observational charts – increased HR and increasing SOB. Patient was diagnosed as having pulmonary oedema (?secondary LVF). ABG revealed hypoxia. Put on 15 L via NRBM. Patient was drowsy and sweaty. Patient given GTN and furosemide but no effect. Reviewed by ITU SpR as RR 40 and patient tiring. Patient taken to ITU for CPAP. Chest X-ray revealed RML and RLL pneumonia with superimposed pulmonary oedema. After 3 days patient was stabilised and transferred to medical ward.

Handover from AICU physio: patient stood between 2. SaO_2 95% on 2 L O_2.

- Day 1 post transfer to the medical wards:
  - On the first physiotherapy assessment a functional assessment was carried out with the physiotherapy assistant as the patient did not fully follow instructions regarding muscle testing and ROM in upper limbs and lower limbs.
  - Patient was independent with lie to sit and had independent sitting balance.
  - However, to get the patient to transfer to the chair took another 30 minutes as the patient became increasingly anxious and not wanting to comply. Patient did stand three times during the course of this but sat down immediately. The nurse looking after the patient was asked to help with transfer. Patient required a lot of reassurance and the purpose of sitting in the chair explained to patient again. Eventually the patient transferred to the chair with supervision of 3.
  - The goal after the initial treatment was to aim to mobilise to the end of the bed by the end of the week. Carer visited in the afternoon who reported patient didn't like being touched.
  - For the next 2 days patient refused to mobilise despite lots of encouragement, reassurance and use of positive instructions and giving patient a goal for the treatment session. The patient was also awaiting a psychiatric assessment. Discussed with the doctors that we would continue to review the patient until the end of the week but that patient's ability to engage with rehab was due to psychiatric problems and that it may be easier to rehab post psych review.
- Day 5: Son was present at the treatment session. Patient reluctantly agreed to mobilise. Patient SOEOB with 2 and then transferred back to bed independently.
- Days 8 and 9: Patient was sitting out with nursing staff. Inappropriate outbursts such as

‘all the haemorrhages were repugnant’. Patient managed four to six stands between 2. Posture very flexed, no correction despite verbal prompts. Unable to use proprioceptive prompts as patient didn’t like being touched and would become increasingly anxious. Briefly marched on the spot. During doctor’s review patient said ‘I don’t trust people’, ‘I don’t want to bounce on the air’, and ‘people are torturing’. With regards to discharge planning it was decided that a psychiatric rehab bed may be appropriate in order to address her psychiatric and physical needs.

- Day 10: Patient refused to mobilise stating: ‘I don’t want to walk on thin air.’
- Day 11: Patient managed four stands and mobilised to the end of the bed with a WZF and minimal assistance of 2.
- Day 12: Slightly more co-operative but still having inappropriate outbursts. STS with 2. Found counting patient in helpful.
  - Over weekend documented by nursing staff that patient transferring (I) at times, and others patient refusing.
  - Day 18: STS × 3 with min A of 2. Unable to take steps as didn’t stand long enough.
  - Psych advised transfer to unit which provides psych and physical rehab.
  - Day 19: Stood with min A of 2 x 3, taking a few steps after each. Mobilised to end of bed with WZF and 2. Lots of encouragement/positive reinforcement to get patient to continue.
  - Day 23: Sat out, flexed in chair and drooling +++. Patient needed lots of coaxing. Managed 5 stands with min assistance of 2. Inappropriate comments.
  - Day 25: Patient had transferred to commode independently.
  - Discussion with ward sister regarding rehabilitation. We both agreed that the patient should be given a chance to rehabilitate as patient had started to engage a little more with therapy and had made some progress (mobilised to end of bed). However no physio cover at psych rehab beds, only OT. Stood independently and mobilised to end of bed with supervision of 2 and WZF. Transferred back to bed independently.

Goals

1. Mobilise to end of bay and back in 1 week.
2. To mobilise to toilet with WZF and 2 in 2 weeks.

Discharge plans

The divisional director for medicine contacted the matron for the Mental Health Team as patient was a delayed discharge and that transferring patient to a suitable place for rehabilitation was extremely important. It was decided that the patient should be moved to a community hospital as there was physiotherapy cover there and the patient could still be followed up by the CPN.

- Day 26: Wanting to go back to bed but agreed to mobilise beforehand. Mobilised to end of bay with WZF and 1, rested in chair, then walked back and returned to bed (I).
- Day 28: Agreed to mobilise as before. STS (I). Mobilised 12 m with WZF bringing chair behind, rested then mobilised back and transferred to bed (I). Increasing motivation and compliance.
- Day 30 patient transferred to community hospital to continue rehab there.

Conclusions

Rehabilitation with this patient was challenging as the main obstacle was the patient's psychiatric problems. This case study demonstrates the need to build a rapport with the patient in order to gain their trust and subsequently allow them to engage in rehabilitation. Flexible communication skills were required such as the use of positive instructions, reassuring the patient and setting clear goals and aims of the treatment session at the beginning. It also demonstrates why it is important that all members of the MDT work together in rehabilitating the patient, i.e. patient sat out by nursing staff.

As patient's trust gained, able to talk to her a little more about things such as the jewellery she was wearing and her doll that she kept with her.

Highlights problems with delayed transfer of care and the need to move patient to a more suitable unit in order to address her needs.

Also demonstrates that daily physiotherapy is not always possible and why it is so important to ensure that there is an MDT approach to rehab.

Chapter 9 Medicine multiple choice questions

1. A patient is admitted with SOB and cough. Which of the following would not indicate that it was a respiratory problem?
   a). Pyrexia
   b). Raised JVP levels
   c). Colour and consistency of sputum
   d). Raised WCC
2. Which would not be an appropriate referral to physiotherapy?
   a). Patient with a long-term tracheostomy, admitted because of diarrhoea and vomiting. No change in respiratory status
   b). Patient from ITU, admitted with productive pneumonia
   c). Patient with infective exacerbation of COPD
   d). Patient unable to clear secretions effectively
3. Which would not be an appropriate referral to physiotherapy?
   a). 29-year-old with sudden onset of undiagnosed breathlessness
   b). 56-year-old male admitted with acute exacerbation of COPD
   c). 69-year-old female with a recent CVA
   d). 82-year-old male with reduced mobility and UTI

4. Which would not be an appropriate referral to physiotherapy?
   a). 78-year-old female admitted with a fall
   b). 44-year-old with fractured ribs and chest infection
   c). 86-year-old requiring stair assessment prior to discharge (lives alone)
   d). 91-year-old from a nursing home, normally hoisted and long history of lower limb contractures
5. What is the normal value for WCC?
   a). $3.5–11.0 \times 10^9/L$
   b). $4.5–11.0 \times 10^9/L$
   c). $6.0–11.0 \times 10^9/L$
   d). $6.5–11.0 \times 10^9/L$
6. What would a raised JVP indicate?
   a). Left-sided heart failure
   b). Pulmonary oedema
   c). Cardiomegaly
   d). Right-sided heart failure
7. What level do neutrophils fall below to class a patient as neutropenic?
   a). $0.01–0.5 \times 10^9/L$
   b). $2.0–7.0 \times 10^9/L$
   c). $1.0–2.0 \times 10^9/L$
   d). $10.0–12.0 \times 10^9/L$
8. Which is not a cause of hyponatraemia?
   a). Kidney disease
   b). CHF
   c). First-degree burns
   d). Decreased water intake
9. Which patient would be your highest priority out of the following?
   a). New CVA patient with dense hemiplegia
   b). Stair assessment for discharge. Patient to be discharged the following day
   c). New patient admitted with reduced mobility requiring 2 to transfer
   d). Patient admitted with infective exacerbation of COPD, ineffective airway clearance and desaturating to below target saturation levels
10. Which patient would be the lowest priority out of the following?
    a). Patient mobilising with the nursing staff on the ward
    b). Patient with predicted date of discharge
    c). Patient not seen the day before
    d). Patient with ongoing rehabilitation needs, awaiting a community hospital
11. Which of the following, associated with falls, would be referred for physiotherapy?
    a). Reduced eyesight
    b). Polypharmacy
    c). Syncope

d). Pain

12. What is a type of cue for patients with Parkinson's disease
    a). Patient counting out loud
    b). Stepping to markers on floor
    c). Rocking prior to sit to stand
    d). All of the above
13. Which would not indicate an MI?
    a). Increased troponin levels
    b). Chest pain
    c). Ischaemic changes on ECG
    d). Raised JVP
14. What is not a symptom of infection?
    a). Pyrexia
    b). Raised WCC
    c). Normal CRP
    d). Increased heart rate
15. What is the normal range for sodium levels
    a). 138–143 mmol/L
    b). 140–150 mmol/L
    c). 135–145 mmol/L
    d). 130–141 mmol/L
16. Which is a necessary skill when working in medicine?
    a). Prioritisation
    b). Delegation
    c). Time management
    d). All of the above
17. Which of the following is the least suitable outcome measure to do at a patient's hospital bedside?
    a). Berg balance
    b). Tinnetti mobility and balance
    c). Home Falls and Accident Screening Tool (HOME FAST)
    d). Timed unsupported stand
18. Which is not an objective marker?
    a). Amount of time a patient can stand unsupported
    b). Distance mobilised
    c). Muscle power
    d). Amount of assistance required to stand
19. You have a patient that is refusing to engage in therapy. Which of the following would be most helpful?
    a). Set SMART goals
    b). Inform medical team looking after patient
    c). Involving family/carers

d). All of the above

20. When does discharge planning begin?
    a). As soon as the patient is admitted to hospital
    b). Once the patient has had a physiotherapy assessment
    c). Once the patient is deemed medically fit for discharge
    d). Once the patient has been discharged by physiotherapy and occupational therapy

Medicine multiple choice answers

1. b)
2. a)
3. a)
4. d)
5. b)
6. d)
7. c)
8. d)
9. d)
10. a)
11. d)
12. d)
13. d)
14. c)
15. c)
16. d)
17. c)
18. d)
19. d)
20. a)

Chapter 10

Mental Health

Introduction

What is the role of the physiotherapist in mental health?

- This is always the first question a physiotherapist working in mental health will be asked and often by other physiotherapists.
- It is quite simply physiotherapy, as defined by the Chartered Society of Physiotherapy (CSP), (www.csp.org.uk): a profession that:

  uses physical approaches to promote, maintain and restore physical, psychological and social well-being, ...

- In mental health the psychological disorder may be the primary health risk and physiotherapeutic skills may be used to reduce this, but it may also be the case that on assessment it is physical dysfunction and the treatment of this that is of paramount importance in the holistic management of the person.
- In all cases it is important to assess and treat the physical difficulties and dysfunction alongside any psychological dysfunction that may be present.
- Working with the multidisciplinary team (MDT) is essential, as it is in many specialties of physiotherapy. In the field of mental health the difference may be that the physiotherapist is regarded as the physical expert in the team.
- The physiotherapist's knowledge has to be broad, so that it is possible to assess a wide range of conditions and evaluate which are appropriate for mental health physiotherapy intervention and which need another specialist physiotherapist, e.g. musculoskeletal.

Concerns of students and clinicians without experience in mental health

- Research undertaken at Cardiff University with students prior to beginning mental health placements has shown that pre placement education helps the student (Sarin 2008). This should be no surprise; however the main reported advantage was not to do with physiotherapy assessment, but rather assuaging the student's fear of violence and

psychological trauma.

- Challenging behaviour management should be addressed within any team working in a mental health setting. It is the responsibility of the individual to ask for training if it is not offered. On in-patient wards, staff are likely to wear alarms in order to summon help for patients or colleagues. In the community, safeguards will include: having clear lone working policies and procedures, which in most cases insist that students or junior staff always work with an experienced member of the team (www.hse.gov.uk).
- As in any health setting the safety of the patient/client and staff is of paramount importance and risk assessment of the treatment environment and of the individual client should be undertaken in all circumstances, in relation to all aspects of safety. Knowledge of the patient is essential and awareness of family and physical environment factors will increase your confidence in working with this client group.

Patients

- A physiotherapist working in mental health will encounter patients with musculoskeletal, neurological, respiratory and other physical dysfunction who also have psychological difficulties or who are experiencing psychological aspects of disease or disorder (Everett et al 2003).
- The type of patients that will be encountered will depend greatly on the structure of the service in which the physiotherapist is working.
- It may vary from primary care for mild to moderate depression and anxiety to long-term and enduring illness in supported housing or may be an acute adult in-patient service or a specialist dementia service.
- The term used for people accessing mental health care is often 'service user', sometimes 'client' and rarely 'customer'.
- Working with older adults however the term 'patient' is most often used.
- Service user, patient and client will all be used in this chapter and the case studies included as part of the web resource accompanying this book.
- Patients are divided by age groups and conditions as follows:
  - Adults of working age
    a. Acute disorder
    b. Long-term and enduring mental health
  - Older adults
    a. Anxiety, depression
    b. Dementia
  - Child and adolescent
  - and also by care groups as follows:
    a. Eating disorder
    b. Conversion disorder
    c. Substance misuse
    d. Forensic services.

The physiotherapy setting

- Experience will vary throughout the UK, with some mental health services there is discrete physiotherapy input in primary, secondary or tertiary services.
- For other patients, seen by their GP or primary care psychological service they may receive their physiotherapy from a general outpatient department.
- Adults referred to a Community Mental Health Team (CMHT), are most likely to be seen by a general physiotherapist initially.
- If patients are referred to a mental health physiotherapist it is usually because of the rigid structure of the process in a general outpatient department, such as the standards relating to appointment times, the discharge of patients if they 'do not attend', fast turnaround assessment and treatment times, often precluding a successful outcome for patients with psychological disorders (Griffiths 2009).

Knowledge specific to mental health

What is mental health?

- A useful definition of mental health is that used by the World Health Organization (WHO):

  Mental health is a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to his or her community (WHO 2010).

- The Mental Health Foundation has defined a mentally healthy individual as one who can:
  - Develop emotionally, creatively, intellectually and spiritually
  - Initiate, develop and sustain mutually satisfying personal relationships
  - Face problems, resolve them and learn from them
  - Be confident and assertive
  - Be aware of others and empathise with them
  - Use and enjoy solitude
  - Play and have fun
  - Laugh, both at themselves and at the world (http://www.mentalhealth.org.uk/welcome/).

What is mental disorder?

- Defining mental disorder is difficult, because it is not one condition, but a group of conditions.
- There is intense debate about which conditions are or should be included in the definition

of mental disorders.

- Specifically in the UK, in relation to personality disorder and substance misuse and for some eating disorders there is disagreement as to their classification.
- For legal purposes, the UK's Mental Health Act (2007) defines mental disorder succinctly as, 'any disorder or disability of the mind'. It is clear that there is a marked circularity to this statement as the WHO states that mental disorder is more than the absence of mental health.
- The focus in this chapter will be on those disorders which are recognised and treated within the NHS and which are likely to be presented to a community mental health trust (CMHT) or mental health inpatient setting.
- It should be remembered that there are many disorders which the physiotherapist may encounter in any physical medical specialty and in general outpatient departments and so this information should be applicable to any physiotherapy setting.

Diagnostic systems

- Both the WHO, International Classification of Diseases, 10th edition (ICD10) and American Psychiatric Association Diagnostic and Statistical Manual-IV (DSM IV) are used to diagnose mental disorder.
- Their purpose is to make a diagnosis and this is not always appropriate as many of the disorders are not necessarily a disease in the medical sense.
- Mental disorder may be described in a biological system focusing on changes in brain chemistry, e.g. hormones, genetic formation.
- Psychological systems focus on personal development and thinking, e.g. cognition. Social systems focus on environment, social structures and family relationship.
- A mental disorder may be described using any individual or combination of these systems.
- The main categories of ICD10 are:
    - Organic disorders, e.g. dementia
    - Pyschotic disorders, e.g. schizophrenia and delusional disorders
    - Mood disorders, e.g. depression and mania
    - Neurotic disorders, e.g. panic, anxiety, obsessive compulsive disorder.
    - Physiological disturbances and physical-based syndromes, e.g. eating disorders (WHO 2010).

Disorders commonly encountered by physiotherapists

- The following descriptions and symptom lists are drawn from WHO ICD10.
- Also included are some definitions from the support organisation 'MIND', which give a

more person-centred description of mental disorders.
– It should be noted that there is still discussion about what schizophrenia is and the MIND website provides information relating to current thinking about schizophrenia (Henriques 2011).

Depression

- Depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration.
- These problems can become chronic or recurrent and lead to substantial impairments in an individual's ability to take care of his or her everyday responsibilities.
- At its worst, depression can lead to suicide, a tragic fatality associated with the loss of about 850 000 lives every year (WHO 2010).
- To come to a diagnosis of depression the symptoms should be present for at least 2 weeks and include four of the symptoms below plus at least one additional symptom:
  – Depressed mood to a degree that is definitely abnormal for the individual, should be present for most of the day and almost every day, largely uninfluenced by circumstances, and sustained for at least 2 weeks
  – Loss of interest or pleasure in activities that are normally pleasurable
  – Decreased energy or increased fatigability
  – Loss of confidence and self-esteem
  – Unreasonable feelings of self-reproach or excessive and inappropriate guilt
  – Recurrent thoughts of death or suicide, or any suicidal behaviour
  – Complaints or evidence of diminished ability to think or concentrate, such as indecisiveness or vacillation
  – Change in psychomotor activity, with agitation or retardation
  – Sleep disturbance of any type.

Bipolar disorder

- Bipolar disorder has in the past been termed 'manic depression', which gives some idea of the presentation.
- It is a mood disorder which has many combinations of low and high mood with or without psychotic symptoms.

Schizophrenia

- Schizophrenia is a severe form of mental illness affecting about 7 per thousand of the adult population, mostly in the age group 15–35 years.
- Although the incidence is low (3 in every 10,000), the prevalence is high due to chronicity (WHO 2010).

- It can be described as a psychosis.
- The view is that a person cannot distinguish their own intense thoughts, ideas, perceptions and imaginings from reality.
- A person might be hearing voices, or may believe that other people can read their mind and control their thoughts.
- There is a view that these symptoms are logical or natural reactions to adverse life events. There is a need to think about individual experience, and the importance of understanding what the experiences mean to the individual.
- Hearing voices, holds a different significance within different cultures and spiritual belief systems (MIND 2010).
- There are many subdivisions of the definition which can be found on the WHO website but all have in common the symptoms stated above often both positive and negative symptoms.
- For some patients though, negative symptoms predominate. These symptoms characterise simple schizophrenia.
- This has a slow progressive development over a period of at least 1 year, of all three of the following:
  - A significant and consistent change in the overall quality of some aspects of personal behaviour, manifest as loss of drive and interests, aimlessness, idleness, a self-absorbed attitude, and social withdrawal.
  - Gradual appearance and deepening of 'negative' symptoms such as marked apathy, paucity of speech, underactivity, blunting of affect, passivity and lack of initiative, and poor non-verbal communication (by facial expression, eye contact, voice modulation and posture).
  - Marked decline in social, scholastic, or occupational performance.

Dementia

- Dementia is not one disease, but rather a group of diseases that lead slowly to memory loss and confusion, affecting people's personality and behaviour.
- There is a decline in ability to carry out normal, everyday activities (MIND 2010).
- The most common types of dementia are vascular, Alzheimer's and Lewy body, but there are also dementias that are caused by alcohol use, syphilis and other disease processes.

Medications which might impact on physiotherapy intervention

Medication for schizophrenia

- Antipsychotic medications are used to treat schizophrenia and schizophrenia-related disorders.

- Some of these medications have been available since the mid-1950s.
- They are also called conventional 'typical' antipsychotics, e.g. chlorpromazine (Thorazine or Largactil) and haloperidol (Haldol).
- In the 1990s, new antipsychotic medications were developed, called second-generation, or 'atypical' antipsychotics.
- Atypical antipsychotics include:
  - Risperidone (Risperdal)
  - Olanzapine (Zyprexa)
  - Quetiapine (Seroquel)
  - Ziprasidone (Geodon)
  - Aripiprazole (Abilify).
- Side effects of many antipsychotics include:
  - Drowsiness
  - Dizziness when changing positions
  - Blurred vision
  - Rapid heartbeat
  - Sensitivity to the sun
  - Skin rashes
  - Menstrual problems for women
  - Agranulocytosis, which is a loss of the white blood cells that help a person fight infection. Patients taking clozapine must get their white blood cell counts checked regularly.
- Typical antipsychotic side effects include:
  - Rigidity
  - Persistent muscle spasms
  - Tremors
  - Restlessness.
- Long-term use may lead to tardive dyskinesia (TD). TD causes muscle movements a person can't control, commonly around the mouth. TD can range from mild to severe. Sometimes TD can cease or partially recover after stopping the medication.
- Atypical anti-psychotic side effects include:
  - Major weight gain and changes in a person's metabolism
  - Increased risk of diabetes and high cholesterol levels.
- A person's weight, glucose levels, and lipid levels should be monitored regularly by a doctor while taking an atypical antipsychotic medication.

Medication for depression

- Depression is commonly treated with antidepressant medications.
- Antidepressants work to balance neurotransmitters such as serotonin, norepinephrine (noradrenaline), and dopamine in order to affect mood and emotional responses.
- The most popular types of antidepressants are called selective serotonin reuptake

inhibitors (SSRIs).

- These include:
  - Fluoxetine (Prozac)
  - Citalopram (Celexa)
  - Sertraline (Zoloft)
  - Paroxetine (Paxil).
- Other types of antidepressants are serotonin and norepinephrine re-uptake inhibitors (SNRIs).
- SNRIs are similar to SSRIs and include venlafaxine (Effexor) and duloxetine (Cymbalta).
- SSRIs and SNRIs cause fewer side effects than the older classes of antidepressants.
- Antidepressants may cause mild side effects that usually do not last long.
- The most common side effects associated with SSRIs and SNRIs include:
  - Headache, which usually goes away within a few days.
  - Nausea, which usually goes away within a few days.
  - Sleeplessness or drowsiness, which may happen during the first few weeks but then goes away.
  - Agitation.
- Tricyclic antidepressants which have been replaced in most cases by SNRIs and SSRIs can cause the following side effects:
  - Dry mouth
  - Constipation
  - Bladder problems
  - Sexual problems
  - Blurred vision
  - Drowsiness.
- Patients taking monoamine oxidase inhibitors (MAOIs; late-stage antidepressants) need to pay attention to dietary intake as these can interact with certain constituents of foods (tyramine) and predispose the individual to increased blood pressure and stroke.

Medications for bipolar disorder

- Bipolar disorder is commonly treated with mood stabilisers.
- Sometimes, antipsychotics and antidepressants are used along with a mood stabiliser.
- Lithium is a very effective mood stabiliser.
- Anticonvulsant medications also are used as mood stabilisers, e.g. valproic acid.
- Atypical antipsychotic medications are sometimes used to treat symptoms of bipolar disorder, often in conjunction with other medications.

Medication for anxiety disorder

- Antidepressants, anti-anxiety medications, and beta-blockers are the most common medications used for anxiety disorders.

- SSRIs such as fluoxetine (Prozac), sertraline (Zoloft), escitalopram (Lexapro), paroxetine (Paxil), and citalopram (Celexa) are commonly prescribed for panic disorder, OCD, PTSD, and social phobia.
- The SNRI venlafaxine (Effexor) is commonly used to treat generalised anxiety disorder (GAD).
- Some tricyclic antidepressants work well for anxiety, e.g. imipramine (Tofranil), is prescribed for panic disorder and GAD and clomipramine (Anafranil) is used to treat OCD.
- The anti-anxiety medications called benzodiazepines can start working more quickly than antidepressants, e.g. clonazepam (Klonopin), which is used for social phobia and GAD, lorazepam (Ativan), which is used for panic disorder and alprazolam (Xanax), which is used for panic disorder and GAD.
- Beta-blockers control some of the physical symptoms of anxiety, such as trembling and sweating, e.g. propranolol (Inderal) is a beta-blocker used to treat heart conditions and high blood pressure.
- Common side effects for benzodiazepines are drowsiness and dizziness.
- Other possible side effects of beta-blockers include: fatigue, cold hands, dizziness, weakness and a worsening of asthma and diabetes, if present.

Physiotherapy assessment

- Assessment aspects for adults with acute mental illness, older adults with dementia, adults with long-term and enduring mental illness will be considered.
- It is the attitude, choice of appropriate approach and consideration of the physiotherapist that can have the biggest impact on the assessment.
- Eating disorder, child and adolescent mental health and substance misuse are not covered in this volume, suggested reading is included in the online material.

Types of referral

- In acute adult wards the most often received referrals are for pain in neck, back, limb joints plus assessment for exclusion of a physical cause for a behaviour, e.g. falling, shaking.
- In older adult wards referrals may also be for above conditions, but mobility is the main concern.
- Co-morbidities of stroke, Parkinson's/parkinsonism, diabetes and epilepsy may all exist alongside the primary diagnoses of functional or organic mental health disorders.

Assessment process

- This will be similar to the assessment undertaken in other areas of physiotherapy.
- In mental health the specialist skills required are in communication, flexibility of approach, and the ability to work with patients.
- Physiotherapy assessment will form a component part of a MDT assessment.
- Knowledge of the symptoms and medication in mental disorder, how these might affect the patient's ability to function and comply with planned treatment is essential.

Subjective information

- Physiotherapy records should encapsulate all relevant medical, psychological and pharmacological information.
- The psychological disorder may be the main focus of the rest of the team, therefore referrals may be lacking in detail or factual content about medical aspects of the patient's history.
- Patient's records will give, in most cases, a diagnosis, medication list and social background.
- Patient records are gradually moving towards being stored electronically, which has the advantage that they will be available and legible when they need to be accessed.
- Mental health patients may have a care programme approach (CPA), which as the name suggests should be a record of the service users' needs and the processes by which those needs will be met.
- Patients who have more than six interventions from a psychiatric professional or who are seen by more than one professional should have a CPA, which will be overseen by a care co-ordinator.
- The care co-ordinator may be a community psychiatric nurse (CPN), a doctor, an occupational therapist or a social worker and in some organisations a physiotherapist will take on this role.
- If a physiotherapist is the care co-ordinator it is usually because of specific physical health needs of the patient, or due to the specific skills set of the therapist.
- Information gained from the service user can vary from being clear and precise to confused and muddled or even imaginary, for those with psychosis or dementia.
- A large part of the skill in assessment approach is differentiation of factual information.
- However there must be respect for the patient and their view of the history of their illness.
- Information about both the psychological illness and physical disorder, must inform an assessment.
- Cultural and ethnic requirements of the patient need to be considered. This should be checked prior to assessment and discussed as part of the consent process.

Assessment of adults of working age with a musculoskeletal condition

Case example: Lower limb fracture, in-patient setting, acute episode of psychosis

- A lower limb fracture is a common referral for young males and may be related to:
  - Trauma, fall, RTA
  - Self harm/attempted suicide by jumping from height
  - Outcome of fleeing from perceived threats, i.e. paranoid thoughts of persecution
  - Assault.
- The cause may not be clear from the referral, so research into the background is essential.
- If the service user is in an acute state of psychosis then questioning is likely to be inappropriate.
- However, it may be possible to assess by observation, e.g. the ease of movement with walking aids and the condition of the leg above and below a plaster.
- Perception of pain in people with psychosis or mood disorders may be distorted in either direction, from hypersensitive to no experience of pain, where pain would be expected.
- Assessment of pain can involve the use of a visual analogue scale (VAS) if the service user is able, but this may have to be defined through observation.
- Non verbal expression of pain may be by facial expression, repeated touching of the affected part, excessive laughing or agitation.
- Discussion with the MDT regarding pain management should be part of treatment plan.
- If the service user is receiving antipsychotic medication, e.g. olanzapine they may be experiencing side effects such as drowsiness or dizziness when changing positions, blurred vision or a rapid heartbeat, all of which could affect their ability to comply with assessment and this should be taken into consideration.
- It will be the physiotherapist who has to provide the patient with information about post operative protocols and also translate orthopaedic reports from medical jargon into lay terms that can be understood by the patient, e.g. NWB, non weight bearing, PWB partial weight bearing and to explain which bone is damaged and what the healing process may be.
- Knowledge of healing times and weight-bearing protocols is essential.
- Liaising with other teams and communication of information to the MDT, and the service user if appropriate, are key physiotherapy skills.
- The risk of complications, e.g. deep vein thrombosis may not have been judged as high by the trauma team as they see the service user as young and active with the only risk factor being a lower limb cast.
- However, if the service user is in an isolative or paranoid phase they may be very immobile and may not take advice.
- The potential risk factors should be part of the physiotherapy assessment and findings must be shared with the MDT.
- A patient might not be able to understand the process of crutch walking, due to their level of psychosis or of general understanding.
- The physiotherapist must be able to assess this and share the findings with the MDT.

- Measurements of range of movement of the hip and knee, if a below knee cast is present or just hip, if the patient is in an above knee cast, should be taken.
- Upper limb strength and range of movement of the joints should be recorded.
- Where possible these should be checked using hands on assessment; however, with a psychotic patient this may not be possible as consent may not be given. In this instance observation will be the closest method of achieving an objective measurement.
- Occupational tasks can be used to assess range and to some extent strength; this is a good technique to develop, e.g. getting the person to reach up to get something for you or for themselves, or simply taking and passing back a reasonably heavy object.
- Personal safety on the ward is a consideration which will need to be assessed along with the rest of the MDT.
- It may be unsafe to give a patient with acute illness a pair of crutches.
- The risks are manifold and may include another patient who does not understand the consequences of pulling crutches away or, who without any malice, might push the person with crutches just to see what happens. The crutches could also end up being used as a weapon, either by the user or another patient.
- There are potential concerns when the patient is on an intensive care ward, where acute illness and the accompanying impulsive behaviour can be hazardous to the patient and other people in the ward.
- Where a patient may have a history of violence to themselves or others, e.g. in a forensic unit the physiotherapist may need to decide upon an alternative to crutches such as a wheelchair.

Adult referred for general fitness/weight management for acute depression

- Persons with long-term and enduring mental disorder are much more likely to have poor general health (MacDonald and O'Hara 1998, Tudor 1996).
- General well being is part of the remit of the physiotherapist in mental health (Everett et al 2003).
- Physiotherapy teams may include technical instructors (TI) or sports instructors.
- A patient referred for improvement of fitness may be assessed by the TI using a health screening tool and only if specific physical problems are found would the referral move to the physiotherapist.
- A pathway for this is covered in the treatment volume.
- A junior physiotherapist may be responsible for managing this process.
- Alongside physical screening psychological tests such as Beck Anxiety Inventory (BAI) or the Hospital Anxiety and Depression Scale (HADS) are used to give some indication of the baseline levels of anxiety and depression of the patient.
- Weight can be measured if a patient, wishes; weight management may include the use of BMI, waist circumference, activity level, plus questions about diet, smoking, and alcohol use in an assessment.

Older adult with dementia, referred as a falls risk

- Assessments for older adults will undoubtedly centre on general mobility and falls risk.
- The nursing team may have carried out a falls risk assessment on admission highlighting the need for physiotherapy intervention or it may be the physiotherapist that undertakes all falls risk assessments.
- There are a number of tools for assessing the risk of falls.
- Organisations may adapt tools to suit the requirements of their service. Examples of falls assessment tools include;
  - STRATIFY (Oliver et al 1997)
  - FRAT, Falls Risk Assessment Tool
  - FULBROOK Local assessment containing triggers
- Assessment should evaluate mobility, strength, balance and confidence.
- The Elderly Mobility Scale (EMS) can be adapted for use in patients with dementia with the useful elements being sit to stand, and timed walk and movement to and from lying.
- Confidence or fear of falling can be assessed using a VAS.
- A simple facial expression indicator is an alternative where the patient chooses the picture of the facial expression which best represents their feelings about walking.
- In assessing older adults in the earlier stages of dementia the following elements are key; communication, patience, expectation of success (Oddy 2003, 2011).
- Consider communication in three areas:
  - Giving
  - Receiving
  - Response.
- In the early stages of dementia short-term memory loss and confusion may be present.
- The other limiting factor for assessment will be the ability of the patient to process instructions or requests.
- Therefore questioning should include; clear, single subject questions and simple directions.
- It is important to allow time for the patient to process the instruction and to respond either verbally or physically.
- Advice points
  - Approach the patient from the front
  - Respect their personal space
  - Address the patient by their name and make eye contact
  - Keep body movements smooth and unhurried
  - Speak clearly in a manner acceptable to an adult
  - Be courteous
  - Use appropriate facial expressions.
- It is also useful to use familiar or local expressions and base your requests on goals, e.g. walk to the bathroom.
- As with all communication techniques some will work better than others for different

people.

- The stage of dementia will affect the success of communication styles.
- An empathetic and reassuring approach delivered in an adequate time frame will ensure an assessment occurs which identifies risk elements and enables the production of a plan to improve the safe mobility of the patient.

It is important to remember that patients with mental health disorders will be encountered in any area of physiotherapy practice.

Wherever the patient is encountered the physiotherapy skills can be applied through good communication, risk assessment and innovation to improve both the physical and psychological health and well being of each patient.

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Chapter 10

E-materials

Author profiles

Jackie Clifford MSc BA Cert. Management GradDipPhys MCSP

Jackie Clifford is a specialist physiotherapist in mental health working as a self-employed Rehabilitation Consultant, based in Worthing in West Sussex.

Jackie has been involved in mental health physiotherapy for over 20 years, and possesses extensive experience of working in acute adult and older adult mental health and in adult learning disabilities services.

Jackie has been an active committee member of national and regional physiotherapy professional networks (CPMH) for physiotherapists working in mental health; and responsible for establishing the regional physiotherapy professional network (CPMH) in London and the South East in 2004.

Jackie has also been involved in Chartered Society of Physiotherapy (CSP) steering groups and in (CSP) publications including guidelines for manual handling, UK information papers on mental capacity, research priorities group for mental health and well being, and a national strategy for the role of physiotherapy in mental health.

Kerry Gibson BSc(Hons) MCSP

Kerry Gibson is a physiotherapist working in Men's Forensics and Neuropsychiatry at Birmingham and Solihull Mental Health NHS Foundation Trust. Previously Kerry was working within acute services in mental health for the same Trust. Currently involved in the management of the clinical education of students, and liaising closely with local universities regarding the current physiotherapy course curriculum; Kerry has recently been appointed Education Lead for the CPMH Committee.

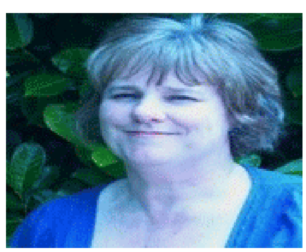
Caroline Griffiths GradDipPhys MCSP

Caroline has worked in various areas of Mental Health both in Primary and Tertiary settings over the last eleven years and is currently the Professional lead for Physiotherapy, Mental Health Division, at Oxford Health NHS Foundation Trust.

An educator in clinical and academic settings she has contributed to many published works on the role of Physiotherapy in Mental Health.

As Chair of Chartered Physiotherapists in Mental Health Caroline was part of the team which created the CSP / CPMH strategy for Mental Health.

Now vice chair and Professional Network representative Caroline sits on the Education Committee of the Chartered Society of Physiotherapy.



Venkat Narayanan MSc BSc(Hons) MCSP

Venkat Narayanan is a Senior Physiotherapy Practitioner working with older people in acute mental Health setting at Oxford Health NHS foundation Trust. Venkat has 11 years of Physiotherapy experience predominantly worked in Neurological Rehabilitation and older people care. He is currently involved in a research project funded by NIHR for evaluating falls prevention in acute inpatient mental health setting.

Appendix 10.1 Laura mitchell relaxation

Background

Laura Mitchell was a physiotherapist who worked in London in the 1960s. She used her knowledge of how muscle groups worked to devise this effective relaxation method.

Many muscles work in opposing pairs, for example the 'biceps' and 'triceps' muscles in your arm. When one contracts the other must relax. So when you bend your arm, your 'biceps' muscle contracts. To enable it to do so, your 'triceps' muscle (at the back of your arm) must relax. It has no choice! The following relaxation method is based on the simple principle of contracting certain muscles to encourage their opposites to relax.

Begin

Lie down in a comfortable position without crossing your legs. If you can't lie down for any reason you can still do this sitting up. Make sure you are comfortable with your arms and legs uncrossed, your feet flat on the floor, and your arms loosely resting at your sides with your hands gently resting on your lap or on the arms of the chair if it has some.

You can start at your feet and work up or start at the head and work down, it's up to you!

Breathing

Close your eyes and notice your breathing. Don't try to change it, just notice and let your attention softly focus on your breath, gently letting go of any other concerns for a short time and allowing yourself to rest here for a few moments.

Feet

Gently point your toes away from your body if you are lying down, or push your feet into the floor if sitting. (Stop if you experience cramp and bring your toes in the opposite direction towards your body.) Hold this position while you count to 5, and then relax. Notice how your muscles feel ... and allow your muscles to rest in the position where they naturally return to.

Repeat.

Legs

Roll your knees apart a little way.

Hold while you count to 5 again, then relax.

Repeat.

Buttocks

Clench your buttocks.

Hold while you count to 5 again, then relax. Remember at each stage to notice how your muscles feel ... and allow your muscles to rest in the position where they naturally return to.

Repeat.

Back/abdomen

If lying down, push the small of your back into the floor.

Hold while you count to 5 again, then relax.

Repeat.

If sitting: pull your abdominal muscles in and sit upright.

Stress-reduction resources from Ruth Hadikin Associates: Supporting Stressed Out Professionals!

Hold while you count to 5 again, then relax.

Repeat.

Shoulders

Pull your shoulders down, away from your head, and slightly back.

Hold for a count of 5, then release.

Repeat.

Elbows

Move your elbows slightly away from your sides. Hold for a count of 5, then relax.

Repeat.

Hands

Stretch your fingers to make them long, hold for a count of 5, then release.

Repeat.

Eyebrows

Raise your eyebrows as though surprised. Hold for a count of 5, then release.

Repeat.

Jaw

- Keeping your mouth closed slowly stretch your lower jaw downwards.
- Hold for a count of 5, then release.
- Repeat.
- Allow yourself to relax. Notice how your body feels.
- Notice your breathing.
- Imagine you are somewhere that is peaceful for you ...
- imagine the sights ... sounds ... smells ...
- Allow yourself to rest here a while.
- When you are ready, slowly bring yourself back to the present moment. Get up slowly.
- Once you have learned the technique you can adapt it and do those parts that are more suitable for you.
- For example the shoulder relaxation is helpful even if you are at work, especially if your work involves sitting at a computer for long periods.
- It is always beneficial to go through the whole routine at least once a day, so your muscles remember the process of letting go and release, and your body doesn't hold on to tension.

Case Study 10.1

Background

- Mary, 72 years old, female diagnosed with psychotic depression.
- She has a medical history of Parkinson's disease with frequent falls.
- Her mental health has declined since her husband died a few years ago.

History of present condition

- Mary was admitted to the acute mental health inpatient setting for her current episode of psychotic depression.
- She has had many recent falls.
- She referred for physiotherapy for falls prevention, management of her Parkinson's disease and to improve her physical and mental wellbeing.

Assessment

Psychological and social

- Mary was particularly withdrawn and declined to participate in activities.
- She cited a lack of energy as the main reason for her non-participation.
- She refused to engage in conversation with staff and other clients.

Physical

- Reduced facial expressions, poor eye blink, with a general look about her that displayed sadness and a depressed outlook.
- Poor posture, with tendency to have flexed hips and knees.
- Bradykinesia particularly in her lower limbs.
- Freezing, this was spasmodic and very much on or off.
- Freezing often occurred when Mary experienced panic attacks.
- Festinating gait.
- Dysarthria, speech was poorly articulated (hypokinetic).

- General weakness of all muscle groups and poor endurance, which was considered to be a result of her reduced participation in exercise and activities.

Baseline assessment

- EMS (Elderly Mobility Scale) produced a score of 4/20 which indicates she is dependent on ADL.
- STRATIFY (Falls Risk) Mary scored 3, which indicated that Mary was a high risk for falls.

Treatment planning

Key aims

- Facilitation of safe discharge, promote independence and quality of life.
- Falls prevention.
- Promote her mental and physical wellbeing through physical activities, e.g. group and one-to-one exercises.
- Manage her Parkinson's symptoms through evidence-based treatment approaches.
- Improve her physical strength and endurance through progressive graded strengthening exercises.

Short-term goals

- Improve therapeutic engagement.
- Reduce the risk of falls.
- Improve gait, balance and physical strength.
- Increase client participation and socialisation.
- Increase awareness of falls risk and prevention.

Long-term goals

- Improve mobility level to borderline capacity, e.g. to achieve 10/20 in EMS from dependent state.
- Improve confidence of balance to use stairs when she is discharged from hospital.
- Enable Mary to attend a gym and exercise group in the community after her discharge.

Analysis/clinical reasoning

- Her balance and mobility problems were not thought to be entirely due to Parkinson's disease.
- There was a possibility that the problems were due to her long-term use of anti-psychotics.
- Differential diagnoses – the following conditions had all been excluded: vascular Parkinsonism, progressive supranuclear palsy, Alzheimer's disease with dementia.
- Moreover her mobility seemed to be improving significantly after her ECT (electroconvulsive therapy).
- The consensus opinion was that her mood and behaviour had a considerable effect on her balance and gait.
- Therefore Mary was included in group activities such as Tai Chi, Tea Dance, and she was included in the exercise group to improve her mental and physical wellbeing and one-to-one physiotherapy exercise sessions were given to improve balance, posture and gait.

Treatment

- 'OTAGO' falls prevention exercises to improve balance and strength.
- Submaximal graded strengthening and physical activities in the gym for 20–30 minutes, including use of equipment such as a reclining bicycle and treadmill.
- Auditory cueing techniques using a metronome, to reduce freezing and festinating gait problems.
- Tai Chi in sitting, to improve relaxation, posture and strength.
- Tea dance and exercise group, to improve mood, socialisation, movement and balance.

Outcomes of physiotherapy intervention

- Client EMS scores improved from 4 to 12/20.
- Mary's participation in group activities become consistent, which improved her mood and socialisation.
- Gait: Improved with auditory cueing technique in terms of stride length, reduction of freezing and festinating gait.
- Mary was able to negotiate a flight of stairs without experiencing fear of falling or loss of balance.

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Case Study 10.2

Background

- 50-year-old lady presented with long-term clinical depression, self-neglect, suicidal tendencies.
- She was a heavy cigarette smoker, with chronic obstructive airways disease.
- After a recent discharge from in-patient acute mental health unit had moved into an inner city hostel, following a period of homelessness prior to hospital admission.
- A physiotherapy referral was made to assist the client with mental and physical health and well-being, exercise tolerance, mobility and functional activity, and self-management of breathing, including relaxation techniques.

Assessment findings

- Respiratory distress and breathlessness at rest, after walking short distances.
- Restricted mobility and functional activity due to shortness of breath.
- Low mood, signs of clinical depression, low self-esteem and evidence of self-neglect.
- Difficulty engaging socially with people.
- Restricted mobility of thoracic and cervical spines and both shoulders.
- General weakness of all muscle groups in both upper and lower limbs.
- Poor exercise tolerance.

Treatment aims

- Maintain and improve self-management of her breathing patterns.
- Maintain and improve mobility and functional activities, e.g. walking.
- Maintain and improve mood, self-esteem, self-care and mental and physical health and well-being.
- Encourage engagement with people and community activities.
- Maintain and improve mobility of her spine and shoulders.
- Maintain and improve general muscle strength and exercise tolerance.

Short-term goals

- To engage with day centre activities programme and physiotherapy service by 4 weeks.
- To increase ability to relax and move gently whilst managing her breathing pattern, within 4 weeks.
- To increase body awareness and ability to move efficiently, within 4 weeks.

Long-term goals

- To be able to engage with community activities, within 8 weeks.
- To improve self-esteem, self-care, mental and physical health and well-being, within 8 weeks.
- To establish an individual exercise programme in order to improve posture, mobility of the spine and shoulders within 8 weeks.
- To establish an individual exercise programme to maintain and improve general strength and exercise tolerance in all muscle groups in the upper and lower limbs, within 8 weeks.

Physiotherapy programme

- Treatment included the following:
  - Individual Tai Chi based exercise programme, in sitting and standing as able, to encourage relaxation, body awareness and gentle movements of the upper and lower limbs
  - Posture awareness and breathing control
  - Exercise programme including; shoulder girdle movements; spinal movements; head control; upper and lower limb mobility and strengthening exercises, e.g. throwing and catching balls at different speeds and over different distances
  - Individual advice and practice for posture awareness, relaxation and breathing control. This included diaphragmatic breathing in sitting, standing, and walking; and appropriate rest positions to assist in breathing control
  - Functional activities including sitting to standing, at different speeds and increasing number of repetitions as the client's breathing pattern and exercise tolerance improved
  - Walking practice, including turning, standing and walking posture, walking different distances and at different speeds depending on client's breathing pattern and exercise tolerance
  - Group exercise programmes including group Tai Chi exercise sessions
  - A home exercise programme, and encouragement to engage in community activities. Client was advised on self-management in home activities based on her breathing pattern and exercise tolerance
  - Time allocation and progression in each physiotherapy session was dependent on the improvement gained from previous interventions and the client's breathing

pattern and exercise tolerance on attendance.

Clinical reasoning and evidence

- The physiotherapy interventions and rehabilitation provided to the patient were supported by the evidence base (Everett et al 2003, CSP 2010, NICE 2010).

Outcomes

- Physiotherapy aims and treatment goals successfully met as follows:
  - Client successfully engaged with her physiotherapy programme
  - Client increased her ability to undertake her exercise programme in the physiotherapy department and at home
  - Client increased her awareness of and self-management of breathing control, breathing pattern, rest positions and relaxation
  - Client maintained and improved her mobility and strength in the upper and lower limbs and developed an increased postural awareness
  - Client increased her ability to undertake functional activities in walking, and engagement in community activities, including joining coach trips to places of interest
  - Client maintained and increased her self-esteem and mood
  - She became more engaged in her self-care and showed good evidence of improved mental health and well-being.

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Case Study 10.3

Background

- Miss J, 24-year-old female.
- Medical student, final year.
- She was informally admitted to the eating disorder in patient unit.
- Miss J had been managed for the past 5 years by day services who had referred her to the eating disorder unit.
- Her GP had diagnosed depression linked with anorexia.

Subjective history

- Miss J reported that her eating disorder began approximately 8 years ago.
- She says that she has been admitted to in-patient services as a result of being on an elective medical placement which meant she had increasingly less contact with day services.
- As a result there had been a deterioration in both weight and her mental state.
- Miss J previously presented with suicidal ideation, but denies any at present.
- She had a history of self harm, i.e. pinching and scratching herself.

Past medical history

- Hypokalaemia.
- Severe nut allergy.

Relevant family medical history

- Aunt diagnosed with bulimia.
- Grandfather diagnosed with dementia.

Social history

- Miss J was bullied at primary and secondary school, and states she was a 'pushover'.
- Miss J often makes references to having low self-worth and finds talking about calorie counting and the subject of weight loss very difficult.
- She was currently living in a student hall of residence and had 2 weeks of her medical degree remaining.
- On discharge she will be returning home to live with her parents.
- Miss J talks about one past relationship which lasted for 3 years, ending approximately 1 year ago, which she says was dysfunctional and in which she was subjected to psychological, physical and sexual abuse.

Assessment

- Miss J complained of a dull ache, felt globally, VAS 7/10, which was aggravated by movement and weight bearing.
- She had full functional range of movement globally.
- Muscle strength in lower limbs was 4/5 Oxford Scale.
- Miss J was very inquisitive about physical exercise tolerance and weight gain in relation to exercise.

ADL, restrictions identified at assessment

- Pain was felt during all ADL.
- She had difficulty walking for more than 10 minutes at a time.

Treatment aims

- Education about why Miss J was experiencing pain.
- Education on the benefits of exercises, how to exercise safely and implications of hypokalaemia.
- Education on how to balance the aims of nursing staff to achieve a weight gain of 0.6 kg per week and carrying out exercise appropriately.
- Working closely with the nursing staff and informing them of progress made and clarification on points where physiotherapy treatment objectives may clash.

Treatment plan

- Global exercise programme targeting all muscle groups, to be carried out twice per week while Ms J is an inpatient.
- Each session to be supervised to ensure that technique used is correct.

Short-term goals

- Reduce pain to 4/10 VAS in 12 weeks.
- To be able to tolerate walking for 30 minutes.
- Miss J to demonstrate understanding about the purpose of exercise and to be able to carry out and increase intensity of exercise in a controlled manner.

Long-term goals for the treatment as a

whole

• To be pain-free and able to carry out all functional activities.

Chapter 10 Mental health multiple choice questions

1. What is the prevalence of mental health disorders in the UK?
    a). 1 in 1000
    b). 3 in 1000
    c). 1 in 4
    d). 10 in 3000
2. Which of the following is a psychotic disorder?
    a). Depression
    b). Eating disorder
    c). Parkinson's
    d). Schizophrenia
3. Electroconvulsive therapy is used to treat ...?
    a). Mild depression
    b). Medication-resistant depression
    c). Eating disorder
    d). Dementia
4. Which of the following is not a form of dementia?
    a). Alzheimer's
    b). Vascular
    c). Lewy body
    d). Huntingdon's chorea
5. When should the physiotherapist ignore verbal aggression from a patient?
    a). Never
    b). When the patient is psychotic
    c). Always
    d). When the patient is depressed
6. Imaginative journey relaxation techniques should not be used for patients with ...?
    a). Depression
    b). Anxiety disorders
    c). Delusions
    d). Early-onset dementia
7. Which of the following is a side effect of a typical antipsychotic medication?
    a). Tardive dyskinesia
    b). Rigidity
    c). Restlessness
    d). All of the above
8. What is OTAGO?

a). A mental health disorder
b). An antidepressant
c). An exercise programme
d). A massage technique

9. What is the most common reason for absence from non-manual work in UK?
a). Anxiety/stress-related disorders
b). Common cold
c). Back pain
d). Depression

10. Which of the following is not a method of falls prevention?
a). Dance
b). Supported sitting
c). Tai Chi
d). Core stability programme

11. Which of the following is not a useful communication method in dementia?
a). Loud repetition of instruction by more than one person
b). Touch
c). Use of familiar phrases
d). Single instruction

12. The Mental Health Act 2007 ...
a). States how and for how long a person can be detained in hospital
b). Gives relatives the power to have a relative detained in hospital
c). Describes mental health medications
d). Is part of a play about mental health

13. The term used for detaining a person under the Mental Health Act is ...?
a). Detention
b). Putting away
c). Sectioning
d). Incarcerating

14. CMHT stands for?
a). Common mental health treatment
b). Community mental health team
c). Community mobility home treatment
d). Care in mental health treatment

15. The most effective treatment for mild depression is ...?
a). CBT
b). Medication
c). Activity and regular directed exercise
d). ECT

16. Which of the following is the major side effect of an atypical antipsychotic medication?
a). Gain
b). Hair loss

c). Headaches
d). Restlessness

17. Which of the following is not an advantage of multigym use in mental health?
    a). Easily measurable progress
    b). Can be used as an element of assessment for cognitive processing
    c). Body building
    d). Clear setting of exercise boundaries
18. Physiotherapists use which of the following treatment/s for anxiety?
    a). Medication
    b). Relaxation
    c). Cognitive behavioural therapy
    d). Ultrasound
19. What body mass index (BMI) level is recommended before moderate exercise in eating disorder rehabilitation?
    a). Above 7
    b). Above 10
    c). Below 15
    d). Above 18.5
20. Which of the following is an antidepressant?
    a). Risperidone (Risperdal)
    b). Olanzapine (Zyprexa)
    c). Quetiapine (Seroquel)
    d). Citalopram (Celexa)

Mental health multiple choice answers

1. c)
2. d)
3. b)
4. d)
5. a)
6. c)
7. d)
8. c)
9. a)
10. b)
11. a)
12. a)
13. c)
14. b)
15. c)
16. a)
17. c)

18. b)
19. b)
20. d)

Chapter 11

Obstetrics and Gynaecology

The role of the women's health physiotherapist

- Physiotherapy has been involved in obstetric care since the early 1900s due to the ground-breaking work of Minnie Randell at St Thomas' Hospital, London (Moscucci 2003).
- The formation of the Obstetric Physiotherapy Association in 1948 made it one of the first physiotherapy clinical interest groups.
- Obstetric physiotherapists expanded their role to encompass gynaecology, with the clinical interest group reflecting this in the title Association of Chartered Physiotherapists in Obstetrics and Gynaecology (ACPOG) in 1976.
- As physiotherapy has developed during the last 40 years, so has the management of women's health and in 1994 the association was renamed as the Association of Chartered Physiotherapists in Women's Health (ACPWH), to recognise the work done for women's health in general.
- This, however, does not reflect the volume of work carried out by many women's health (WH) physiotherapists treating male incontinence and erectile dysfunction.
- With 700 members worldwide the association is also a founder member of the International Organization of Physical Therapists in Women's Health (IOPTWH).
- WH physiotherapists are involved in the 4 spheres of physiotherapy; health promotion, prevention, treatment and rehabilitation, as defined by the World Confederation for Physical Therapy (WCPT 1999).
- This may involve promoting healthy lifestyles and posture in pregnancy or preventing pelvic floor dysfunction through teaching normal bladder and bowel function; treating musculoskeletal dysfunctions occurring in pregnancy or urinary incontinence as the consequence of pelvic floor dysfunction. These problems require the WH physiotherapist to draw on core skills of rehabilitation in order to improve or resolve a patient's problems.
- Physiotherapy departments which provide women's health services vary in the breadth of care they offer.
- The following list outlines services that WH physiotherapists may be involved in:
  - Health promotion classes in pregnancy
  - Back or pelvic girdle pain classes
  - Parent education classes

– Antenatal exercise classes
– Aquanatal classes
– Treatment of musculoskeletal problems during pregnancy and post birth
– Postnatal exercise classes
– Inpatient obstetric care
– Inpatient gynaecology care
– In- and outpatient breast care
– Treatment of pelvic floor dysfunction in men and women
– Lymphoedema services.

Obstetrics

When first entering a WH setting there will be terminology and processes that a student or physiotherapist may not have encountered previously. For example, the term 'gravida' describes the number of times a woman has conceived a pregnancy, and 'parity' describes the number of times a women has delivered a viable baby (classified as >24 weeks).

Physiotherapy services in obstetrics

- Treatment of musculoskeletal changes in pregnancy and puerperium.
- Back care classes in pregnancy.
- Antenatal exercise classes.
- Postnatal exercise classes.
- Parent education classes.
- Ward based education and treatment pre- and post-delivery.

Physiological changes in pregnant women

- The physiological changes that occur through pregnancy place increasing demands on a woman's body, which should not be underestimated (Mantle et al 2004).
- Pregnant women are often not aware of the rapid changes that occur to their body and may present with symptoms that concern them greatly.
- WH physiotherapists have the ability to inform and educate pregnant women about the normal physiological changes that occur during this period and in turn reduce their anxiety.
- Physiotherapists can also identify neuromusculoskeletal changes, treat and manage dysfunctions with their knowledge of the body.
- It is therefore important that physiotherapists working in obstetrics fully understand the normal physiological and musculoskeletal changes in pregnancy in order to identify possible abnormalities.

- The following sections discuss some of the more common physiological and musculoskeletal changes in pregnancy, however this is not inclusive.
- The changes during pregnancy can be broadly split into:
  - Hormonal changes and their consequences
  - Cardiovascular system changes
  - Changes associated with the growth of the fetus
  - Musculoskeletal adaptations in response to mother's increase in body weight.

Hormonal changes and their consequences

- There remains a lot to learn about the hormonal changes in pregnancy and importantly for the physiotherapist their role as a causative factor of musculoskeletal pain.
- It seems that progesterone, oestrogen and relaxin have an important role in some of the physiological and anatomical changes in pregnancy.
- All three are produced by the corpus luteum up to 10 weeks of gestation, when the placenta also starts to produce them and fully takes over this role from the second trimester onwards (12 weeks).
- Relaxin is thought to peak in the first trimester and then drops by 20% to remain steady for the remaining trimesters.

Effects of progesterone

- Reduction in tone of smooth muscle, resulting in:
  - Reduced peristaltic movement, so food may stay longer in the stomach, coupled with an increase of water absorption in the colon leads to constipation.
  - Slower bladder emptying.
  - Dilatation of the ureters and lengthening to accommodate size of the fetus.
  - Urethral tone is reduced, which may result in stress incontinence.
  - Reduced tone in the smooth muscles of the blood vessels, leading to varicose veins and hot hands due to pooling of fluid.
- Increase in nasal and vaginal production.
- Increase in temperature by 0.5–1.0°C. Pregnant women often feel warm and the temperature of the treatment area needs to considered, so they do not feel uncomfortably warm.
- Reduction in alveolar and arterial pCO_2 tension.
- Pregnant women will be increasingly short of breath, even at low levels of exercise, which may lead to hyperventilation.
- Development of the alveolar and glandular milk-producing cells in the breasts. Breast size enlarges from early on in pregnancy which can change posture and cause strain to the thoracic or cervical spine.
- Increased storage of fat.

Effects of oestrogens

- Increase in growth of uterus and breast ducts.
- Increasing levels of prolactin to prepare breasts for lactation.
- May prime receptor sites for relaxin.
- Increase in water retention.
- Increase in vaginal glycogen, predisposing to thrush.

Effects of relaxin

- Gradual replacement of collagen with a remodelled modified form that has greater extensibility and pliability.
- Inhibition of myometrial activity during pregnancy up to 28 weeks, after which women can then become aware of Braxton Hicks contractions.
- Uterus distends from its usual 'small pear' size holding 6 ml of fluid to its full-term size of holding 5000 ml of fluid.
- There is controversy surrounding the role of relaxin as a cause of musculoskeletal pain. Since being discovered in 1926, relaxin has traditionally been thought to be the main reason for musculoskeletal pain in pregnancy.
- It has been presumed that manual therapy is not beneficial for joints that are in effect hypermobile.
- However, recent research has found that there is no correlation between serum levels of relaxin and pain.
- There is also no evidence to confirm that those with increased joint laxity or stiffness have an increased incidence of pain.
- It is now generally considered that relaxin is a causal factor in musculoskeletal pain in pregnancy; however pain is not caused by general increase in mobility, rather an asymmetrical difference between joints, particularly the sacroiliac joints.

Cardiovascular system changes

- Blood volume increases by 40% to supply the increasing demands of the uterus and placenta.
- This is not accompanied by an increase in red blood cells, only plasma, so the haemoglobin levels fall to around 80%. This is known as physiological anaemia, which may result in tiredness and malaise.
- The heart increases in size and accommodates more blood, so the stroke volume rises and the cardiac output increases by 30–50%. Exercise will produce an increase in cardiac output, therefore this should be considered when teaching an exercise programme to a pregnant woman.
- Later in pregnancy, the weight of the fetus may compress the aorta and vena cava in the supine position causing dizziness and in extreme circumstances unconsciousness. This is

known as supine hypotension. Not all women will suffer from this condition, however. Physiotherapists need to be aware about the potential effects of supine lying later on in pregnancy.

- Prolonged vigorous exercise should be avoided as this will result in redistribution of the cardiac output to the working muscles and away from the abdominal organs, importantly the uterus and placenta (Artal et al 1991).

Changes associated with the growth of the fetus

Respiratory system

- The growth of the fetus causes changes to the respiratory system by displacing the diaphragm upwards by 4 cm or more.
- This causes the ribs to flare outwards and the subcostal angle to increase from 68° to 103° and can cause breathlessness, as the respiratory excursion is limited at the lung bases.
- The costochondral junctions may become more hypermobile and therefore costal margin pain or rib ache is not uncommon.

Urinary system

- Throughout pregnancy there is an increase in blood supply to the urinary tract in order to cope with the additional demands of the fetus for waste disposal.
- The size and weight of the kidneys increase, whilst the ureters become dilated and elongated to circumvent the enlarging uterus.
- This may cause ureteral reflux or kinking with possible pooling and stagnation of urine leading to an increased risk of urinary tract infections.
- Later on in pregnancy the bladder becomes an intra-abdominal organ, the supporting fascia is stretched and the urethrovesical angle may be altered.
- Pregnant women may therefore complain of frequency, urgency and stress incontinence.

Musculoskeletal adaptations

- Posture will generally change in pregnancy due to a woman's adaption to the change in the position of her centre of gravity.
- The breasts increase in size by an average of 400–800 g, causing altered thoracic and cervical posture.
- There is a general thought that all spinal curves increase in pregnancy; however Ostgaard et al (1993) found that women generally had an exaggeration of their pre pregnancy posture and those at most risk were those with a naturally large lordosis.
- The distance between the vertical bands of rectus abdominus muscles will widen during

pregnancy as the linea alba stretches and sometimes splits.

- A doming of the abdominal muscles occurs during the actions of sitting forward or pulling to get out of bed. Women may need reassurance that this is a normal part of pregnancy. They should be educated about the correct way to get in and out of bed, e.g. rolling onto the side and swinging the legs over the edge of the bed, whilst simultaneously pushing the trunk up using a hand on the bed. This may help to reduce the occurrence of diastasis.
- There is a general increase in water retention resulting in oedema, generally to the dependent areas of the body. This can lead to symptoms of carpal tunnel syndrome as the median and ulnar nerves are compressed. Problems such as facial nerve palsy and meralgia paraesthesia are also seen as a result of pregnancy.
- The common musculoskeletal conditions encountered in WH include:
  - Pelvic girdle pain
  - Back pain
  - Coccydynia
  - Carpal tunnel syndrome
  - Rectus abdominus divarication.

Some of the minor ailments associate with pregnancy

- Nausea and vomiting (hyperemesis gravidum).
- Gastro-oesophageal reflux (heartburn).
- Constipation.
- Back and pelvic-girdle pain.
- Carpal tunnel syndrome.
- Haemorrhoids.
- Varicose veins.
- Urinary tract infection.
- Urinary dysfunction – stress and urge incontinence.
- Itching and rashes.
- Painful, enlarged breast.
- Mild breathlessness.
- Headaches.
- Tiredness.
- Insomnia.
- Labile mood.
- Calf cramps.
- Braxton Hicks contractions.

Assessment

- It is important to understand the normal anatomical, physical and emotional changes that occur in pregnancy and the puerperium in order to understand the abnormal dysfunction that can occur which may lead to pain.
- The physiotherapist will need to draw upon core assessment skills irrespective of the specialist area they work in, with assessment involving history taking, screening and the use of specific tests or measures, and evaluation of the results of examination through analysis and synthesis within a process of clinical reasoning (WCPT 1999).
- A holistic approach to the assessment is important in order to understand the demands both physically and emotionally the woman has in her life.

Outpatient assessment

Subjective assessment

- History of the present complaint (HPC):
  - When did it start?
  - How?
  - 24-hour pattern
  - Aggravating and easing movements or activities
  - Red flags. Women are equally prone to cauda equina compression and the development of serious pathology as any other woman of equivalent age.
- Obstetric special questions:
  - Pain on urination, burning and increased frequency of micturition, potentially due to a urinary tract infection?
  - Sudden increase in swelling, particularly face, frontal headache, dizziness, visual disturbance (flashing lights), epigastric pain, nausea and vomiting, due to pre-eclampsia?
- Current obstetric history:
  - General health during the pregnancy
  - How is care being delivered? Once a woman discovers she is pregnant she will be cared for by either her GP, a community midwifery team, shared care between her GP and midwifery team or Consultant Obstetrician. Consultant care is usually preserved for those with current or previous complicated pregnancies
  - Fetal movements (FM) should be felt after the 20th week of pregnancy in a first pregnancy and around 17/18 weeks in subsequent pregnancies. FM should be felt daily.
- Previous obstetric history:
  - Is there a history of musculoskeletal dysfunction in previous pregnancies?
  - Type of labour and recovery in the puerperium

  - History of postnatal depression?
  - These questions may highlight a woman's anxiety about her current pregnancy and may change her perception of any pain.
- Past medical and surgical history:
  - Diabetes
  - Hypertension
  - Previous gynaecological surgery, treatment or endometriosis may have pelvic adhesions causing discomfort as the fetus grows, stretching and compressing pelvic structures. This may cause lower abdominal pain, similar to the stretching of the round ligament
  - Previous general surgery
  - Pregnant women are not exempt from other health complaints. The older the women is at conception the more likely it is for them to have pre-existing conditions.
- Drug history:
  - Many medications are contraindicated in pregnancy
  - Women should consult their GP or obstetric consultant regarding which medications are safe for them to take
  - There are analgesic medications which are safe to take if guidance is given by a medical practitioner.
- Social history:
  - Work/life balance assessment
  - Working conditions
  - Support at home with ADLs
  - Hobbies and sporting activities
  - Dependent children.

Objective assessment

- Assessment starts from the point at which the physiotherapist first observes the woman. Observation of them sitting, standing up and walking into the examination cubicle will start to give an impression of the severity and causative factors of the dysfunction.
- Routine observations include:
  - Posture in standing, a raised plinth may be needed for support
  - Forward leaning and returning into standing – looking for movement patterns and quality of movement
  - Active straight leg raise with and without compression
  - Range of movement of joints, noting stiffness and/or pain
  - One leg stance – noting movement pattern and pain.
- Women may be able to lie prone with pillows, but may find it more comfortable to side lie or sit in a high forward-leaning position. The physiotherapist should be able to adapt their assessment according to the comfort of the woman.

- The physiotherapist should draw on the core assessment skills when assessing specific joints or areas of the body and seek assistance from a WH or musculoskeletal physiotherapist where appropriate.
- Full neurological assessment should be conducted where clinically appropriate.

Ward-based assessment

- The role of the WH physiotherapist on the postnatal wards is to encourage recovery after delivery and pregnancy, through education and exercise.
- There are a wide variety of service arrangements across the UK and not all maternity wards will have physiotherapy input.
- WH physiotherapists have to be innovative in the way in which this group of women with very specific needs is cared for.
- Some units will see the majority of woman; some will see those classified as high risk of developing future problems and some women will have no physiotherapeutic intervention.
- Women spend increasingly less time on postnatal wards and therefore it could be argued that physiotherapists would be best placed seeing groups of women in the community at baby clinics, health visitor meetings or other such groups.
- The most important aspect of physiotherapy intervention is that the information and care is delivered with the needs of the woman being central to ensure an effective outcome.

Early postnatal care

- There are specific issues encountered during the early postnatal period, including:
  - Perineal discomfort
  - Back or pelvic girdle pain
  - Identify those at high risk of developing urinary or faecal incontinence
  - High risk of developing urinary or faecal incontinence, due to a forceps delivery, the baby's weight being greater than 4 kg, a prolonged second stage of delivery and a third- or fourth-degree tear.

Gynaecology

- As part of an obstetric experience students and newly qualified physiotherapists may be required to treat patients after gynaecological surgery.
- This surgery can be minor, e.g. day surgery or involve an overnight stay through to major surgery for gynaecological cancer.
- Some centres will have dedicated gynaecology physiotherapists who will treat the patient holistically, whereas others will have general physiotherapy input either from respiratory

or rehabilitation physiotherapists.

- Sometimes women may have attended for out-patient WH physiotherapy treatment, or advice before surgery for stress urinary incontinence or uterine prolapse.
- The material in this volume considers that the approaches described are for specific gynaecological physiotherapy.

Types of surgery

- To enable effective management of patients' knowledge of the most common investigations and surgical interventions is essential (Table 11.1).

Table 11.1 Investigations and surgical interventions encountered in gynaecology

Bilateral salpingoophorectomy (BSO)	Removal of both ovaries and fallopian tubes
Colposcopy	Abnormalities detected on cervical smear A colposcope is a microscope which magnifies the cervix. Biopsies may be taken
Cystoscopy	An examination of bladder lining under anaesthetic using a thin 'telescope' inserted into a fluid-filled bladder
Debulking	For ovarian tumours, may include removal of ovaries, uterus, cervix and omentum
Dilatation and curettage (D&C)	Cervix is dilated and contents or sample of the inner lining of the uterus is removed by suction
Hysteroscopy	A thin flexible tube used to look inside the uterus and take a biopsy
Inguinal node dissection	Lymph nodes near the vulva are removed following a vulvectomy (unilateral or bilateral)
Laparascopy	A telescope enabling the surgeon to view the organs inside the pelvis
Laparotomy	Abdominal incision enabling abdominal inspection. Transverse suprapubic incision may be employed (Pfannenstiel). A vertical incision is preferred in ovarian malignancy or for access to the upper abdomen
LLETZ	Outpatient treatment for cervical dysplasia (premalignant lesions) aims to remove abnormal cells from the cervix
Omenectomy	Removal of the fatty tissue overlying the bowel
Pelvic exenteration	For recurrent cancer of the cervix after radiation therapy, tailored to remove the tumour and those organs involved (Hatch and Berek 2005)
Pelvic node dissection (PND)	In cases of suspected malignancy, pelvic and para-aortic nodes may be excised
Radiotherapy (external/brachytherapy)	Radiotherapy for gynaecological cancer may be used pre- or postoperatively, as an alternative to surgery, or as palliative treatment

Radical total abdominal hysterectomy (RTAH)	Removal of the uterus, fallopian tubes, ovaries, and upper one-third of the vagina
Radical trachelectomy	For fertility preservation in patients with early-stage cervical cancer, involves removal of the uterine cervix plus adjacent parametria, conserving the uterine body and ovaries (Grant 2006)
Sentinel lymph node biopsy (SLNB)	To locate and assess spread of cancer in the primary lymph node(s) draining lymph from the area in which the cancer developed
Subtotal abdominal hysterectomy	Uterus is removed through an incision in the abdominal wall; cervix and ovaries are conserved
Total abdominal hysterectomy (TAH)	Removal of the uterus, body and cervix, through an incision in the abdominal wall
Vulvectomy	Several stages of vulvectomy exist, including laser surgery for preinvasive abnormal cells, simple vulvectomy when the entire vulva is removed and radical vulvectomy (partial or complete)

Preoperative assessment

- Surgery is often complex and a preoperative assessment is recommended (Cook et al 2004).
- This should include:
  - Assessment of risk factors, such as obesity, cigarette smoking, debilitative state, previous or planned radiotherapy/chemotherapy, diabetes, chest, heart or circulatory conditions.
  - Patient education regarding knowledge and skills for the post-operative and recovery periods.
  - Some centres have their own specific literature or use resources provided by Macmillan cancer support (http://www.macmillan.org.uk/Home.aspx).
  - Time spent talking to the patient can also be a way of educating them.
  - Postoperative assessment, i.e. after the patient has returned to the ward will be the same as for any major surgery.
  - The course of the postoperative period depends on the extent of the surgery, pre-existing perimorbid conditions and the development of complications.

Assessment of outpatients with continence dysfunction

- Risk factors for urinary incontinence include the following:
  - Age and gender
  - Ethnicity

- Pregnancy and childbirth
- Connective tissue factors
- Smoking, obesity and constipation
- Hysterectomy and urinary incontinence
- Genital prolapse and urinary incontinence
- Radiotherapy and urinary incontinence
- There are many types of urinary incontinence as defined by the international Continence Society and the International Urogynaecological Association (ICS and IUGA 2009) (Box 11.1).

- As with any condition it is important to establish the exact nature of the problem, i.e. is the problem with storage or emptying, when and how often does it occur, when did it start.
- A full obstetric, medical and surgical history should be documented, along with current drug therapy.
- An essential part of an assessment is a bladder diary enabling the patient to record the time, quantity and type of fluid drunk, the frequency of going to the toilet, the quantity voided and the number of incontinence episodes.
- A 3-day diary is usually recommended to confirm the pattern of day-to-day bladder function.
- Adult fluid output from the kidneys varies between 1 and 3 litres per 24 hours, with approximately 80% excreted during waking hours, negating the need to empty the bladder at night.
- The average adult bladder capacity is in the range 300–600 ml.
- Normal frequency is 6–8 voids in 24 hours.
- Most departments will have a standard pro forma for patients to use.
- To quantify the amount or severity of leakage a pad test is sometimes undertaken, using a preweighed pad.
- The patient usually undertakes a set of exercises which precipitate leakage and then the pad is re-weighed.
- If poor bladder emptying is suspected the measurement of a post-void residual using an ultrasound scanner or in/out catheter should be carried out. Residuals should normally be less than 100 ml.
- Urinalysis should also be undertaken to test for signs of infection, diabetes or haematuria. If any of these tests are abnormal then the patient should be referred to an appropriate specialist.
- A neurological examination should be carried out to test the appropriate dermatomes and myotomes.
- An abdominal examination is undertaken to assess skin condition, surgical incisions including palpation to identify sites of pain, any abnormal pelvic masses, hernias or a distended bladder.
- A physical examination of the external genitalia and pelvic floor muscles (PFM) is essential.

- These assessments require specific training and should only be undertaken following adequate teaching and then under supervision.
- During a vaginal examination, with the patient in crook lying, observations include skin condition, vaginal oestrogenisation status, presence of scars or prolapse (Table 11.2).
- Many of the findings can be recorded on three rings of continence (ROC) representing findings on a vertical and horizontal plane (Figure 11.1).
- The largest ROC represents the vagina, with 12 o'clock denoting the anterior and 6 o'clock the posterior segment; 9 o'clock represents the patient's right lateral wall and 3 o'clock the left.
- The smaller anterior ROC represents the urethra, and the smaller posterior ROC represents the anal canal (Haslam and Laycock 2008).
- During a pelvic floor examination the contraction of the PFM is assessed and often recorded under the acronym PERFECT (Table 11.3) (Laycock and Jerwood 2001).
- This acronym was developed and validated to assess PFM contraction and enable the planning of patient specific muscle training regimens.

Example:	P	E	R	F	E	C	T
	3	5	4	7	Y	Y	N

Box 11.1 Types of urinary incontinence (ICS/IUGA definitions)

- Urinary incontinence: complaint of involuntary loss of urine
- Stress urinary incontinence: complaint of involuntary loss of urine on effort or physical exertion, or on sneezing or coughing
- Urge urinary incontinence: complaint of involuntary loss of urine associated with urgency
- Postural urinary incontinence: complaint of involuntary loss or urine associated with change of body position, e.g. rising from a seated or lying position
- Nocturnal enuresis: complaint of involuntary urinary loss of urine that occurs during sleep
- Mixed urinary incontinence: complaint of involuntary loss of urine associated with urgency and also with effort or physical exertion or on sneezing or coughing
- Continuous urinary incontinence: complaint of continuous involuntary loss of urine
- Insensible urinary incontinence: complaint of urinary incontinence where the woman has been unaware of how it occurred
- Coital incontinence: complaint of involuntary loss of urine with coitus. This may be further divided into that occurring with penetration and that occurring at orgasm
- Urgency: complaint of a sudden, compelling desire to pass urine which is difficult to defer
- Continence: voluntary control of bladder and bowel function

Table 11.2 Examination using the three rings of continence method

2 planes of pelvic floor muscle examination (PV)	
Vertical plane	**Horizontal plane**
12 o'clock – symphysis pubis 6 o'clock – perineal body 4 & 8 o'clock – pubococcygeus palpated by distal pad of flexed finger	Finger fully extended 12 o'clock – coccyx 6 o'clock – perineal body 4 & 8 o'clock – pubococcygeus palpated at base of finger 10 & 2 o'clock – iliococcygeus – distal pad

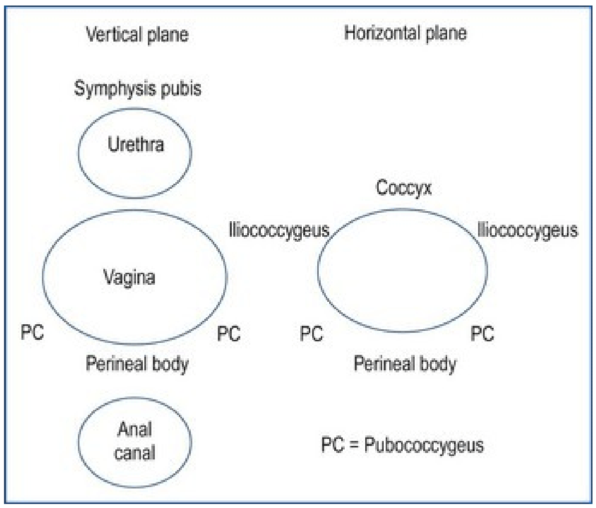

Figure 11.1 ROC, vertical and horizontal planes.

Table 11.3 The PERFECT scheme

P Power	A measure of strength of a maximum voluntary contraction
E Endurance	The time in seconds the MVC can be held before strength reduces by 50% or more
R Repetitions	Number of times the MVC can be repeated
F Fast contractions	
E Elevation	Lifting of the posterior vaginal wall during a MVC
C Co-contraction	Co-contraction of the lower abdominal muscles during an MVC
T Timing	Synchronous involuntary contraction of the PFM on coughing

- This assessment describes a patient with a 'normal' (grade 3) Maximal Voluntary Contraction (MVC), held for 5 seconds and repeated 4 times, followed after a rest by 7 fast contractions. In addition elevation of the posterior vaginal wall and co-contraction of the lower abdominals was detected, but involuntary contraction of the PFM on coughing was not demonstrated.

- Aim of treatment here was to increase strength and endurance (repetitions), also more importantly the 'knack'.
- Strength is measured using the Modified Oxford Scale (Table 11.4).
- Assessment of the PFM may also be undertaken using electromyography, which is the extracellular recording of bio-electrical activity generated by muscle fibres.
- Surface EMG, using intravaginal or anal devices may be used.
- Vaginal squeeze pressure measurement and transperineal or transabdominal ultrasound imaging are two further methods of assessing and providing feedback to patients.

Table 11.4 Modified Oxford Scale

Grade 0	No discernible PFM contraction
Grade 1	A flicker, or pulsing under the examining finger, a very weak contraction
Grade2	A weak contraction – an increase in tension in the muscle without any discernible lift or squeeze
Grade 3	A moderate contraction, characterised by a degree of lifting of the posterior vaginal wall and squeezing on the base of the finger (pubovisceralis) with an indrawing of the perineum. A Grade 3 or higher contraction are generally discernible on visual perineal inspection
Grade 4	A good PFM contraction producing elevation of the posterior vaginal wall against resistance and in-drawing of the perineum. If two fingers are placed laterally in the vagina and separated, a grade 4 contraction can squeeze them together against resistance
Grade 5	A strong contraction of the PFM; strong resistance can be given against elevation of the posterior vaginal wall and approximation of the index and middle fingers as above

Bowel dysfunction

- Requires a detailed medical, surgical and obstetric history.
- It is important to find out about the history of symptoms:
  - Usual bowel pattern and consistency
  - Urgency with an ability to defer defecation
  - Presence of urge or passive incontinence/soiling
  - Presence of blood and mucus
  - Ability to control flatulence, or pain.
- It is also important to establish the presence of defecation difficulties such as having to sit on the toilet a long time, straining, use of digital stimulation, feeling of obstructed defecation.
- A list of medications taken by the patient should be established and these should include over-the-counter medications as well as those prescribed.

- Other factors which need to be recorded are the patient's diet, if they smoke, their weight, any recent changes, fluid intake, skin problems, and the effect of their bowel dysfunction on their lifestyle and relationships.
- A bowel diary is also an essential part of the assessment for those patients with bowel symptoms. This will record the frequency of defecation, stool type (Figure 11.2) and soiling episodes (Lewis and Heaton 1997).
- A physical examination should include inspection of the perianal skin, of the perineum for scarring from episiotomy or obstetric tears, inspection of the posterior wall of the vagina for any rectocele, perineal descent, presence of a loaded rectum and a digital examination of the anal canal to determine resting and squeeze tone.
- This should only be performed following appropriate training.
- Constipation is present if patients who do not take laxatives report at least two of the following in any 12-week period during the previous 12 months (Rome Foundation 2010):
  - Fewer than three bowel movements per week
  - Hard stool in more that 25% of bowel movements
  - A sense of incomplete evacuation in more than 25%
  - Excessive straining in more than 25%
  - A need for digital manipulation to facilitate evacuation.
- Functional constipation can either be slow-transit constipation, where there is delayed transit through the colon and rectum, or obstructed defecation, but not outlet obstruction, associated with advancing age. This includes syndromes such as descending peroneum, dyssynergia (anismus) and anterior rectal wall prolapse.

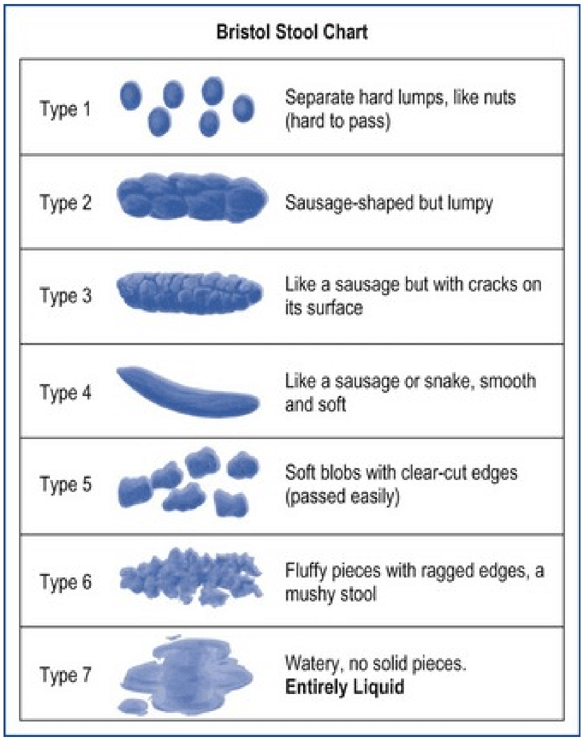

Figure 11.2 Bristol Stool Chart.

Prolapse

- Genital prolapse or pelvic organ prolapse (POP) refers to a loss of fibromuscular support of the pelvic viscera resulting in a vaginal protrusion.
- The prolapse is usually described according to the area of the vagina in which it occurs.
- Anterior vaginal prolapse generally involves the bladder (cystocele) and often involves hypermobility of the urethrovesical junction as well.
- Posterior vaginal prolapse can involve the rectum (rectocele), small bowel (enterocele) or the sigmoid colon (sigmoidocele).
- Apical prolapse describes loss of the support at the apex of the vagina.
- Vaginal vault prolapse refers to a complete or partial inversion of the vaginal apex usually found in patients who have had a hysterectomy.
- Prevalence: 50% of parous women have some degree of prolapse, but only 10 to 20% seek evaluation.
- There is multifactorial aetiology, including pregnancy and childbirth, hormonal factors, constipation, smoking, obesity, exercise, previous pelvic surgery.
- Most women complain of feeling discomfort or heaviness within the pelvis in addition to a 'lump coming down'.
- Symptoms tend to become worse with prolonged standing and towards the end of the day.

- They may also complain of dyspareunia, difficulty in inserting tampons and chronic low back ache.
- In cases of third-degree prolapse there may be epithelial ulceration and lichenification, which results in a symptomatic vaginal discharge or bleeding. These may be associated with lower urinary tract (LUT) symptoms of urgency and frequency in addition to a sensation of incomplete emptying.
- Posterior vaginal wall prolapse may be associated with difficulty in opening the bowels.
- Assessment.
- Similar to continence assessment, or pelvic organ prolapse – quantification (POP-Q) (Hagen and Stark 2008).

Pelvic pain

- Chronic pelvic pain has been defined as 'non-malignant pain perceived in structures related to the pelvis of either men or women'.
- Pelvic pain syndrome has a separate definition proposed by Abrams et al (2002) and adopted by Fall et al (2004) as the 'occurrence of persistent or recurrent episodic pelvic pain associated with symptoms suggestive of lower urinary tract, sexual, bowel or gynaecological dysfunction'.
- There is no proven infection or other obvious pathology.
- The true prevalence and incidence of PFM pain syndrome alone or coexisting with other chronic pelvic pain conditions is unknown.
- They are complex and challenging conditions with a significant lack of evidence underpinning the basic elements of PFM therapy for pelvic pain or muscle over-activity.
- A comprehensive assessment should incorporate a bio-psychosocial approach.
- The PFM should be evaluated for the presence of over-activity, trigger points, and reduced elasticity.
- The aim of assessment is to reproduce and quantify the patient's symptoms.

Consent

- Each department should have an agreed policy on the consent required prior to any intimate examination.
- It is essential to obtain and record valid consent (some institutions require written consent) and with any refusal recorded.
- The GMC has published guidance for doctors undertaking intimate examinations (GMC 2006).
- Clinical guidelines for the Physiotherapy Management of Females aged 16–65 years with stress urinary incontinence are available from the CSP (Laycock and Jerwood 2001).

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Chapter 11

E-materials

Author profiles

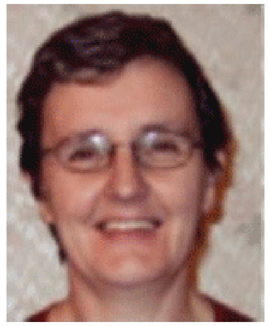
Becky Aston MA MCSP

Becky Aston qualified in 1997 from the University of East London and has been a specialist in Women's Health for more than 10 years. She completed a Post graduate diploma in WH at the University of Bradford in 2002 and a Masters in applied research methods from the University of Brighton in 2010.

She has presented at national and international conferences and published on the subject of pelvic floor dysfunction. Becky has been a member of the Association of Physiotherapists in Women's Health for more than 10 years and has been a member of both the journal and executive committees.

Doreen McClurg PhD MCSP

Doreen is a Reader at the Nursing, Midwifery and Allied Health Professions Research Unit, Glasgow. Doreen has been involved with Women's Health Physiotherapy for many years, mainly working at the Belfast City Hospital. Following completion of her PhD in 2007 she moved to Glasgow to be able to undertake full time research in the area of pelvic floor dysfunction. She is actively involved in the Association of Chartered Physiotherapists in Women's Health and past Chair of the Association of Continence Advice.



Appendix 11.1 Glossary

Braxton Hicks: spontaneous painless contractions of the uterus. These usually occur in the third trimester and are sometimes called 'practice contractions'

Breech presentation: fetus head is at the uterine fundus (top of the uterus) and the baby's buttocks lie over the maternal pelvic outlet

Embryo: term from conception to 8 weeks of pregnancy

FD: forceps delivery

Fetus: term for the growing baby after it is 8 weeks old

Full-term delivery: occurs after a gestational age of 37 weeks

Human gestational period: lasts approximately 40 weeks and is split into 3 trimesters each lasting 3 months in duration

Hyperemesis gravidarum: excessive morning sickness – usually occurs in first trimester, but in some pregnancies will continue longer

LSCS: lower segment caesarean section

Puerperium: the 6–8 weeks following birth

Rectus abdominus divarication: separation which occurs between the two recti abdominus muscles

SVD: spontaneous vertex delivery

VD: ventouse delivery

Case Study 11.1

Obstetrics

- Sarah, aged 29.
- 22 weeks into pregnancy has started to get some low back pain and pubic pain.

History of present condition

Gradual insidious onset of both the lower back and pelvic pain.

Pubic pain

Intermittent pain, started at 18 weeks of pregnancy. Pain located directly over pubis, feels like a nagging deep ache with occasional sharp twinges when stands from sitting. VAS at best 0/10, at worst 6/10. Pain does not radiate anywhere else.

Aggravators	**Easers**
Walking for 30 minutes	Reduced pain after rest
After swimming	Less pain on her work days
Worse at the end of the day	
Sexual intercourse	
Sit to stand – sharp pain	

Lower back pain

Has had back pain for a number of years on and off, sees an osteopath every 3 months. Intermittent ache, centrally over lower lumbar spine. VAS at best 0/10, at worst 5/10. No radiating pain, numbness or pins and needles. Reports some leakage of urine when she sneezes and lifts her son up. This started after her last delivery and has got worse since becoming pregnant again.

Aggravators	**Easers**
Bending forward to pick up toddler	Curling up in a ball
Bathing toddler	Ibuprofen used to help, but doesn't want to take it now pregnant
Car journeys more than hour and a half	

Past medical history

- Appendicectomy aged 22.
- Anorexia between the ages of 14 and 19.

Past obstetric history

- Gravida 2 parity 1.
- Forceps delivery 18 months ago, secondary degree tear which required some stitches.
- Current pregnancy, had a lot of morning sickness, vomiting most days. Now just settling.

Drug history

Nil.

Social history

- Lives with her husband and 18-month-old toddler.
- Works 3 days a week as an office manager.
- Is swimming 2 times a week, breast stroke.

Significant points from the assessment

- Posture: Increased lumbar spine lordosis, locks knees in standing and poor abdominal tone.
- Forward flexion in standing demonstrated little lumbar spine flexion, movement gained from hips.
- Anterior–posterior palpation of lumbar spine demonstrated pain from L1–5.
- Pain on palpation of pubis.
- Limited hip abduction due to pubic pain and tight abductors.

Goals

1. To eliminate pubic pain when changing positions.
2. To be able to walk for 30 minutes without pubic pain.
3. To reduce back pain to a VAS of 3/10 when bathing her toddler.

Treatment session one

- Discussed and explained the reason for back and pelvic pain in pregnancy and focused on postural changes that occur.
- Taught pelvic tilting in sitting and standing using a wall in standing to gain concept of 'flattening out' the lower spine.
- Re-educated postural alignment in standing with a long mirror to provide proprioception. Focused on soft knees, finding pelvic neutral, gentle lower abdominal activity, relaxed shoulders.
- Performed a pain-free hold relax technique on hip abductors//gained increased pain-free range of hip abduction.
- Taught a gluteal muscle strengthening exercise as a home exercise programme and advised to avoid breast stroke legs when swimming. To try freestyle legs with a float in the arms or a float between the legs and breast stroke arms.

Treatment session two

- Referred to the back care class for pregnant women for education and general advice.

Treatment session three

- Sarah reported that the pubic pain was much improved. She reported that it was now a 2/10 at the end of the day. She no longer had pain on sit to stand as she was squeezing her gluteal muscles as she stood up – a technique she had learnt in the back care class.
- She had also learnt how to perform a pelvic floor exercise in the back care class and was tightening her pelvic floor muscles as she lifted her son and found she could stop a leak of urine.
- She reported that the back pain was much better, however it felt very stiff at the end of the day and it was difficult to bath her son.

Outcome

Sarah reached all her goals and continued to work on her posture and home exercise programme through the pregnancy. She was contacted 6 weeks after the delivery of her second child and offered an appointment for pelvic floor rehabilitation. She accepted as wanted to improve her bladder control completely.

Possible contributing factors to her pain

- History of bulimia.
- Morning sickness – Valsalva through pelvic floor and weakens support structures.
- Pregnancies close together and small child to care for. Pain was less on her work days when she had less manual handling of her son.
- Breast stroke.
- Poor posture, with poor abdominal support.

Case Study 11.2

Background

- Mrs B, a nulliparous, aged 52 years.
- She worked 6 days a week as a shop assistant.

History of present condition

- Referred to physiotherapy with a 3-year history of urinary frequency with urge and bladder discomfort, that was gradually getting worse.
- She voided from ½- to 2½-hourly during the day with the longer interval being on 'good days'.
- Her micturition commenced without effort, but the flow tended to dribble and if she strained it did not improve.
- She had very occasional minimal stress urinary incontinence with a sneeze, but this was not a problem to her.
- Nocturia was 0–1 times.
- She had to strain at times with defecation, but evacuation was usually complete.
- She commented that she needed time to sit and relax to evacuate.

Assessment

- On examination puborectalis had good contraction (grade 4) with a hold of 3–4 seconds, right pubococcygeus had good bulk and strong lift (grade 5) with a 10 second hold which was slow to release; left had less bulk but good lift (grade 4) hold similar and slow to release.
- She had no awareness of muscle release.
- There was no evidence of oestrogen deficiency.
- On further questioning Mrs B admitted that she was very busy and stressed as she was also looking after her elderly parents.
- She admitted that she was better on her day at home and that she never sat on the toilet seat at work, always hovered above it.
- Her first void of the day was 500 mL and this was emptied without effort or discomfort.
- Day volumes were 25–150 mL.
- Fluid intake was l.5 L and was either tea or water, with an occasional glass of wine at the weekend.

Management

- Mrs B was instructed to place paper on the toilet seat and to sit to void; to take time to fully release the pelvic floor muscles and to use the voiding retraining pattern – lean slightly forward with a normal lumbar curve allowing the abdominal contents to fall forwards.
- The abdomen can then be pushed forward by diaphragmatic descent into a relaxed anterior abdominal wall.
- It was emphasised that she needed to give herself time to empty her bladder completely without straining, and making sure her pelvic floor was relaxed.

- She was also advised to change to decaffeinated tea.
- Defecation retraining was added and her diet was reviewed, but was generally good.
- Within 2 weeks day frequency was reduced, urine volumes increased and discomfort significantly improved.
- However, on stressful busy days there was a tendency for the old habits to return.
- The advice was again re-enforced and goals were introduced, whereby she had to take time out for herself to go to the toilet.

Outcome

- She returned for a final visit one month later and was feeling much more confident.
- She revealed at this appointment that she had been afraid that she was going to end up like her mother who had been incontinent of urine for many years.

Case Study 11.3

Background

- Victoria, aged 47.
- She looks after her family and was the main carer for her father who had been partially disabled by a stroke 2 years previously.
- Victoria's father was relatively independent, needing assistance with certain tasks, e.g. getting in and out of a car, or when showering.
- Her main hobby was going to a keep fit class at the local gym once a week.
- Victoria had 3 children aged 15, 10 and 7 years.

History of present condition

- Victoria was complaining of urinary leakage during her keep fit classes.
- She had a chest infection last winter and first noticed it then.
- She was experiencing some perimenopausal symptoms.

Past medical history

- P1 forceps delivery with stitches.
- P2 and 3 normal delivery though P3 second stage was quick.
- No other significant medical history.

Assessment

- A 3-day bladder diary showed frequency of voiding 7 times per 24 hours, one of which was during the night.
- No bladder pain or dysuria.
- Fluid intake 1.5 L per day, which included 3 cups of tea, and the rest water.
- No history of constipation or previous gynaecological treatment.
- Smear tests were up to date and normal.
- Slightly overweight Body Mass Index (BMI).
- She had stopped smoking 16 years ago.
- On further questioning it was revealed she would tend to have low back pain in the evenings.

Vaginal assessment

- Stage 2 prolapse.
- Episiotomy scarring.
- Weak pelvic floor muscle, grade 1.
- Leakage on cough.
- Urethral position normal.

Drug history

Nil.

Significant points from the assessment

- Weak pelvic floor muscles, which were slow to engage (Modified Oxford score Grade 2) MVC, held for 4 seconds, (repeated 3 times).
- The patient reported a painful area towards the posterior part of the pubococcygeus.

Goals

1. To eliminate leakage when at exercise class.
2. To re-educate the pelvic floor muscles.
3. To teach the patient the self-efficacy by introducing home exercises and self-help techniques.

Treatment session one

- Possible reasons for the development of SUI were explained to Victoria.
- She was shown a model pelvis and diagrams of the vagina, urethra, anus and of the pelvic floor muscles.
- Victoria was given time to ask any questions or air any concerns she may have had.
- Vaginal assessment identified several trigger points on the pubococcygeus and these were treated using modified ischaemic pressures, held for 6–12 seconds.
- The patient was taught a self-help technique 'Sniff, Flop and Drop', an explanation of this technique can be found in Whelan (2008).
- Victoria was advised to use this technique 15 times, twice a day, every day.
- Correct defecation and lifting techniques were also discussed.

Treatment session two (2 weeks later)

- Trigger point release was repeated as per session 1.
- Transabdominal ultrasound scanning was used for feedback to the patient on correct contraction of the pelvic floor muscles.
- The patient was encouraged to continue with the 'Sniff, Flop and Drop' technique at home and to begin gentle pelvic floor muscle exercises and tightening the muscles before coughing or other actions known to produce leakage.

Treatment session three (2 weeks later)

- Victoria reported that she felt less discomfort in the perineal area, although she had not realised there was any.
- Leakage was still present if she was undertaking jumping exercises, but she could prevent it occurring when coughing or sneezing, if she thought about tightening her pelvic floor muscles.
- Further trigger point release was undertaken, but the area was found to be less sensitive. Pelvic floor muscle training was encouraged, as she could now maximally release.

Treatment session four (1 month later)

- Victoria reported that she felt much more confident about attending her keep fit class.
- To supplement her PFM she was instructed to undertake a submaximal transversus abdominis contraction just before tightening her pelvic floor.
- Using the ultrasound imaging it was possible to see that this reduced the bladder neck descent even further.

- Victoria was instructed to continue her home exercise programme, gradually increasing the length of hold, and also increasing the number of fast contractions.

Treatment session five (1 month later)

- Victoria was feeling much more confident and reported that she now felt in control of her bladder.
- She was able to attend keep fit sessions, usually with no leakage.
- Her original goals had been reached and the patient was discharged with the advice to continue a maintenance programme of exercises.

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Chapter 11 Obstetrics and gynaecology multiple choice questions

1. After 12 weeks of pregnancy, the placenta produces the hormone relaxin. Which of the following statements is incorrect?
    a). Up to 28 weeks of pregnancy relaxin causes inhibition of myometrial activity
    b). Relaxin causes collagen to become more extensible
    c). Relaxin causes increased hair growth
    d). Relaxin allows the uterus to distend as the foetus grows
2. Which of the following statements is incorrect?
    a). The effects of progesterone cause slow peristaltic gut movement leading to constipation
    b). Relaxin increases steadily up to 37 weeks of pregnancy
    c). Oestrogen causes an increase in water retention
    d). Oestrogen, progesterone and relaxin are produced by the corpus luteum until 12 weeks of pregnancy
3. There are many minor ailments of pregnancy, which of the following is not one of them?
    a). Pre-eclampsia
    b). Carpal tunnel syndrome
    c). Varicose veins
    d). Insomnia
4. Which is the false statement?
    a). Pregnant women may be able to lie prone for assessment if they are comfortable
    b). Straight leg raise with and without compression is useful in the diagnosis of PGP
    c). Pregnant women should not lie supine at any stage of pregnancy
    d). Manipulations are not contra-indicated in pregnancy
5. What is not a clinical symptom of pelvic girdle pain?
    a). Pain radiating into the groin

b). Pain radiating into the pelvic floor area
c). Pain in sciatic nerve distribution
d). Pain in lumbosacral region

6. Physiotherapy-led parent-education classes do not classically include which of the following?
   a). Information on baby vaccinations
   b). Coping strategies for labour
   c). Birthing positions and breathing awareness
   d). Pelvic floor exercises
7. Carpal tunnel syndrome is a very common condition in pregnancy. Which of the following treatments is unlikely to help?
   a). Ice packs
   b). Serial casting
   c). Elevation
   d). Wrist splints
8. What is meralgia paraesthesia?
   a). A dangerous obstetric condition, which needs immediate medical attention
   b). A nerve compression problem, which causes temporary foot drop
   c). A compression of the lateral femoral cutaneous nerve
   d). A benign uterine growth
9. In the postnatal period, pelvic floor exercises are thought to be beneficial for a number of reasons, which of the following will they not help with?
   a). Weight loss
   b). Reducing swelling
   c). Increasing circulation and healing
   d). Muscle strengthening
10. Which is the true statement?
    a). Back pain is common in pregnancy and automatically gets better after delivery
    b). The cause of back pain is due to the hormonal change and therefore is not treatable
    c). Women with coccydynia will find it difficult to sit down without pain
    d). The use of TENS is contraindicated in pregnancy
11. A women who leaks urine only when jumping has
    a). Urge urinary incontinence
    b). Stress urinary incontinence
    c). Nocturia
    d). Dysuria
12. Following surgery for prolapse the re-occurrence rate is approximately?
    a). 5%
    b). 10%
    c). 30%
    d). 50%
13. Antimuscarinic medication is sometimes prescribed for

a). SUI
b). Urge urinary incontinence
c). Nocturia
d). Faecal incontinence

14. Several factors may predispose the development of urinary incontinence. Which is false?
    a). Being overweight
    b). Smoking
    c). Driving
    d). Pregnancy
15. A post-void residual of more than 100/150 ml is considered high. In which condition would this not be found?
    a). Stress urinary incontinence
    b). Poor detrusor contraction
    c). Detrusor sphincter dyssynergia
    d). Prostatic enlargement
16. If a woman feels she needs to pass urine when out shopping she should
    a). Hover over the toilet seat to avoid getting infections
    b). Sit on the toilet seat
    c). Hold on until she gets home
    d). Limit her time away from the house so she does not need to use a public toilet
17. Which one of the following does not cause/affect urinary leakage
    a). Low oestrogen levels postmenopausal
    b). Taking an oral contraceptive
    c). Having a shower
    d). Laughter
18. Urinary incontinence occurs more often in the elderly. Which is the false statement?
    a). It is an inevitable part of ageing
    b). It increases the likelihood of falls
    c). It may be due to drugs prescribed for non-urological conditions
    d). Faecal impaction can exacerbate urinary incontinence
19. Which of the following may develop following a TAH and BSO
    a). Urinary incontinence
    b). Eczema
    c). Osteoarthritis
    d). Miscarriage
20. Which of the following may be used as conservative treatment for pelvic organ prolapse
    a). Cranberry juice
    b). Pelvic floor muscle exercises
    c). Cervical collar
    d). Antibiotics

Obstetrics and gynaecology multiple choice answers

1. c)
2. b)
3. a)
4. c)
5. c)
6. a)
7. b)
8. c)
9. a)
10. c)
11. b)
12. c)
13. b)
14. c)
15. a)
16. b)
17. b)
18. a)
19. a)
20. b)

Chapter 12

Oncology and Palliative Care

Introduction

- The primary aim of physiotherapy in oncology and palliative care is to reduce the effects of the disease and to maximize independence with regard to physical, psychosocial and economic function.
- Physiotherapeutic objectives vary, being determined by a holistic approach to assessment (physical, psychological, social and spiritual) and goal setting in partnership with the patient (Wood-Dauphinee and Küchler 1992, ACPOPC 1993).
- A holistic approach in oncology and palliative care is particularly important as patients tend to have a complex mix of symptoms and problems that may not be physical in nature. It is imperative that the physiotherapist considers how each of the patient's problems link together, e.g. how anxiety may influence breathlessness.
- Goal setting is essential, with goals being reviewed relative to a patient's changing condition, to maintain hope, increase confidence and to achieve a feeling of success, especially towards the end stages of life.
- Working in an oncology and palliative care environment can be emotionally demanding. The physiotherapist may often face sensitive situations where advanced communication skills are vital.
- If the physiotherapist is unable to answer questions from a patient they must seek advice from a senior member of staff.

Preparation for assessment

- In an inpatient setting medical notes will be a source of information about the history of the patient.
- The physiotherapist will need to explore the current history, previous history, social history, drug history and consider any recent test results e.g. blood results, MRI scans, X-rays, myotome testing and dermatomal testing.
- It is important to know normal values for tests and how results may influence a patient's condition (Appendix 12.1).
- Before beginning the assessment discuss the case with the multidisciplinary team (MDT), to gain useful information and insight about the patient.
- In an outpatient or community setting, access the patient's notes, which will contain clinic review reports, test results and plans for treatment.

- Find out how much the patient knows about their diagnosis and how much they want to know.
- Some patients use denial as a coping mechanism and it is important that this is respected.
- In some cases it may be the family who do not want the diagnosis or prognosis disclosed. To avoid colluding with family members the physiotherapist should discuss the situation with the MDT and get a consensus on how this should be managed.
- A physiotherapist should always discuss any concerns that they may have about communicating with the patient or relatives with a senior colleague.
- The physiotherapist should know why the patient has been referred, but allow the patient to express their concerns and problems.
- Discharge planning should start from the day the patient is admitted and should involve the MDT, including the hospital discharge co-ordinator.
- The physiotherapist needs to attend regular team meetings and case conferences, recognizing the needs and expectations of the patient.

Subjective assessment

Observations and values

- In the in-patient setting it may be important to check observations such as heart rate, blood pressure and blood values.
- With many oncology and palliative care patients, these normal values may be at the lower or higher ends and this does not necessarily preclude physiotherapy intervention.
- The physiotherapist should be aware of any relevant local policies or guidelines.

Communication

- Ensure adequate time and privacy have been allocated.
- The physiotherapist should introduce themselves to the patient and explain their role, sitting down if possible to indicate that they have time to listen.
- Open questions should be used to encourage the patient to talk, e.g. 'How are you today?' rather than 'how is your pain?'
- It is essential to establish what the patient knows about their condition, a useful phrase might be 'Can you tell me about what has been happening to you?'
- In an outpatient/community setting where the patient has been referred for a specific problem, it is important to give the patient the opportunity to share other problems too, e.g. 'You have been referred by your consultant for... (the specific problem). How are you today?' or 'Have you any other difficulties that I may be able to help with?' these openings provide the patient with the opportunity to raise other concerns.
- Ask the patient to prioritize their problems, if they have several, e.g. 'What are your three

biggest problems at the moment, starting with the one that is the most troublesome for you?' This gives the patient the opportunity to highlight concerns from their point of view rather than the impersonal way that they can be listed in the medical notes.

- The patient should be encouraged to express their feelings, e.g. it may be appropriate to ask 'what worries you most about your situation?' Attending to verbal cues can help the physiotherapist to identify and explore a patient's anxieties.
- For example:

  'I don't want to die the way my father did.'

  'Can you tell me what you mean by that?'

  'Well, he died struggling for breath and it was very frightening.'
- Reflecting the question back to the patient may allow deeper exploration of concerns, which can then be discussed.
- For example

  'Do you think I'll ever walk again?'

  'What makes you ask that question?'

  'Well, I'm wondering what my future will be like if I can't walk.'
- It may be useful to summarize what the patient has just said from time to time and feed back to the patient, to check for accuracy and allow clarification of any misunderstanding.
- For example:

  'Can I just check, when you said you would like to go home, did you mean for the weekend or are you talking about the long term?'
- One of the most challenging tasks for a physiotherapist in oncology and palliative care is achieving the right balance between professional honesty and maintaining hope during communication.
- It is best to give a more generalized answer to questions initially and then check for the patient's response, with a more detailed answer being given if the patient requests more information.
- If the patient stops in the middle of a sentence, repeating the last three words back to them may encourage them to continue.
- For example

  'Sometimes I feel ...' (pause)

  'Sometimes you feel ...'

  'Sometimes I feel that I might not walk again.'
- The physiotherapist should avoid filling silences with conversation. Silence may feel uncomfortable or lengthy to the physiotherapist, but it is likely that the patient will find such pauses a useful opportunity to think.
- The physiotherapist may not always know the answer to a question and it is important to acknowledge this, explaining to the patient that you will ask the most appropriate person to answer the question to come and speak with them.
- A patient's information needs vary considerably during the course of their illness and it is important to be mindful of this.

- Some patients manage to live parallel realities, having the capacity to acknowledge the serious nature of their illness, yet hope for a cure or remission. Others can appear to have full insight and acceptance one day and be in denial the next, oscillating back and forth throughout the course of their illness. Accept a patient's insight as it presents on a day-to-day basis.
- Having exchanged the necessary information, the patient and the physiotherapist can agree goals.
- Goals need to be relevant to the individual patient and in some cases they may need to be short term. If a goal seems unattainable, break it down into smaller goals. This is more likely to foster a feeling of success for the patient.
- Let the patient know that the conversation is coming to a close, this provides them with an opportunity to ask any other questions. 'We have covered a lot of ground, is there anything else you would like to ask?'

Red and yellow flags

- 'Red flags' may be identified that warrant further medical assessment.
- 'Yellow flags' often indicate psychosocial risks, which entail further assessment and specific treatment interventions (Appendix 12.2).

Goal setting

- Following subjective assessment, goals need to be set with the patient.
- Goals need to be specific and personal to the individual (Bovend'Eerdt et al 2009).
- SMART goals can be set (Table 12.1), with involvement of the family or carers if the patient consents to this.
- To ensure effective multidisciplinary team-working the MDT need to be aware of the goals.

Table 12.1 SMART goal setting

Specific	The goal should be specific to the individuals needs The goal is discussed with the patient to understand why it is important to them The patient's diagnosis, prognosis, social background and timing of treatment intervention must be considered when setting the goals
Measurable	The physiotherapist and the patient must be able to measure success It is essential the physiotherapist uses a repeatable outcome measure to show the efficacy of treatment, to guide clinical decisions and further goal setting
Attainable	Goals should challenge the patient, but at the same time need to be achievable. Starting with short-term goals will allow the patient to maintain their motivation and then longer-term goals can be set

Realistic	This is often the most challenging part when setting goals. The physiotherapist may need to negotiate with the patient and family/carers to ensure goals are not unrealistic. If goals are not going to be achieved it will cause frustration and upset for the patient especially
Timely	The goal should have a clear start date and the physiotherapist should use reflections with the patient to show progression The goals should be set at the most appropriate time of the patient's condition and reviewed on a regular basis A written diary may be useful to allow the patient to see written evidence of their progression

Outcome measures

- Clinical outcome measures should be valid, reliable, sensitive and relevant to a patient's individual clinical needs and treatment goals, taking into account their status and care setting. (Appendix 12.3).

Assessment of specific symptoms or problems

Breathlessness

- Twycross (2003) defined 'breathlessness as the subjective experience of breathing discomfort'.
- Breathlessness is 'subjective, like pain, it involves both perception of the sensation by the patient and his reaction to the sensation' (Heyse-Moore et al 1991).
- The patient's emotional state and other symptoms can have a direct impact on the symptom of breathlessness.

Assessment

- A respiratory assessment is undertaken, considering the diagnosis, treatment and care setting.
- The specifics of the assessment will vary, e.g. in an acute ward setting, a patient diagnosed with cancer may present with a chest infection, therefore it would be appropriate to auscultate the chest, check oxygen saturation levels and to observe the pattern and work of breathing. In a palliative care setting where a patient has advanced lung cancer, it is appropriate to focus on the breathing pattern and technique, considering factors influencing the breathlessness such as anxiety.
- Each patient must be assessed on an individual basis.

- The most commonly used outcome measures for breathlessness are the Modified Borg Scale (Box 12.1) and the Visual Analogue Scale (Figure 13.1, Chapter 13). Both are reasonably simple to use and most patients can understand them (Wilson and Jones 1989).

Box 12.1 Modified Borg Scale

0	Nothing at all
0.5	Very, very slight, just noticeable
1	Very slight
2	Slight
3	Moderate
4	Somewhat severe
5	Severe
6	Severe
7	Very severe
8	Very severe
9	Very, very severe, almost maximal
10	Maximal

Exercise tolerance/deconditioning

- Weakness, fatigue and deconditioning due to lack of exercise are common problems.
- Cancer treatments are toxic to the body and can result in marked loss of physical function.
- Patients in palliative care settings can have significant muscle weakness and mobility issues. The complexity of combined symptoms can be challenging, e.g. cachexia which affects muscle mass and exercise tolerance as a result of derangement in the body's metabolism, due to a tumour or by the response of the body to a tumour such as cytokine activity (Hawkins 2007).
- Activity has been proven to be beneficial for cancer patients and the assumption that rest will help increase energy levels and exercise tolerance should be challenged (Hawkins 2007).

Assessment of de-conditioning and exercise tolerance

- Cancer patients may receive physiotherapy at any stage of their illness and in various clinical settings.
- Assessment for the level of de-conditioning will include multiple factors (Box 12.2).
- It is generally accepted that platelet levels should be above 20×10^9/L for gentle exercise and 50×10^9/L for increase in physical activity using resistance.

- Neutrophil levels should be greater than 0.5 × 10^9/L in order to avoid exposure to infection (Rankin et al 2008) (Appendix 12.1).
- Patients undergoing treatment are especially subject to physical and psychological change as they respond to therapeutic regimens (Schneider et al 2003).
- Assessment should include awareness of complications and avoid exacerbating the cytotoxic effects of treatments (Appendix 12.4).
- In palliative care, the assessment should be adjusted according to disease and increasing fragility, caused by exacerbating symptoms such as bony metastases and ascites.
- With a deteriorating condition the aim of treatment will be to maintain function, stamina, mobility and quality of life, in addition to controlling symptoms.

Box 12.2 Considerations when assessing deconditioning and exercise tolerance

- Cancer history, including site and stage of cancer
- Current treatment, drugs and side effects, time of administration
- Past medical history
- Previous activity levels and current exercise tolerance, timed walk test
- Cardiovascular assessment, resting heart rate, CV potential
- Pulmonary function and oxygen saturation
- Muscle power 0–5 (Medical Research Council scale)
- Range of movement and flexibility
- Assessment of neurological problems
- Balance
- Fatigue
- Nutritional status and gastrointestinal status
- Psychosocial status

Fatigue

- Cancer-related fatigue (CRF) is a complex multifactorial symptom affecting many patients in all phases of the disease.
- It has been described as a common persistent and subjective sense of tiredness related to cancer or to cancer treatment that interferes with usual functioning.
- 70–100% of cancer patients experience CRF (Lundh et al 2006).

Assessment of CRF

- The subjective sense of tiredness can be difficult to assess to get an accurate picture of how a patient is being affected.
- It is common in oncology and palliative care.
- The NCAT Rehabilitation Pathways (2009a, b) for Fatigue and Energy Management

provide a framework for evaluating the effects of CRF. It is based on a Visual Analogue Scale of 0–10, 10 being the worst fatigue, with a score of 4 and above requiring specialist multidisciplinary intervention. Scores below 4 should be informed about coping strategies.

- The International Classification of Diseases has developed criteria to aid CRF diagnosis (Box 12.3).
- Fatigue is also a common symptom of depression and if suspected should be referred for appropriate assessment.
- Fatigue measurement tools are essential to assess both the fatigue itself and outcomes of interventions.
- Effort is required to complete the assessment tasks. In the palliative setting a shorter scale may be more appropriate.
- There are a range of commonly used outcome measures for measuring fatigue (Appendix 12.3).

Box 12.3 Criteria of cancer-related fatigue

- Symptoms:
  - Significant fatigue
  - Diminished energy
  - Increased need to rest, disproportionate to any recent change in activity level
- Plus 6 or more of the following:
  - General weakness or heaviness of limbs
  - Diminished concentration
  - Decreased motivation or interest in usual activities
  - Insomnia or hypersomnia
  - Experience of sleep as un-refreshing or non-restorative
  - Perceived need to struggle to overcome inactivity
  - Marked emotional reactivity to feeling fatigued, e.g. sadness, frustration, irritability
  - Difficulty completing tasks due to feeling fatigued
  - Perceived problems with short-term memory
  - Post exertional malaise lasting several hours
- These symptoms are not considered to be a consequence of other conditions (Cella et al 2001)

Lymphoedema

- An accumulation of fluid and other elements (e.g. protein) in tissue spaces, as a result of imbalance between interstitial fluid production and transport (usually a low-output failure). It may manifest as swelling of one or more limbs including the corresponding quadrant of the trunk. Swelling may also be found in other areas, e.g. head and neck,

breast and genitalia (Lymphoedema Framework 2006).

- Caused by congenital dysplasia, (primary lymphoedema) or anatomical obliteration, e.g. after radical operations, such as axilla or retroperitoneal nodal sampling, irradiation or repeated lymphangitis (ISL 2009).
- Lymphoedema is incurable and prompt treatment is required to manage signs and symptoms effectively. The patients at risk need to be identified if they develop signs and symptoms and referred to local and regional services via the MDT (Box 12.4).

Box 12.4 Signs and symptoms of lymphoedema

- Feeling of heaviness, tightness, fullness or stiffness
- Clothing or jewellery may become tight
- Aching
- Observable swelling
- Skin marking from underwear

Assessment of lymphoedema

- Lymphoedema may present at any time following a diagnosis or treatment for cancer.
- The physiotherapist should be able to identify signs of lymphoedema, these might include:
  - History and/or physical and functional assessment
  - History of infection and cellulitis
  - Assessment of swelling, including shape of limb and if an adjacent quadrant affected
  - Scarring and subcutaneous changes such as fibrosis and tissue thickening
  - Posture and positioning
  - Pain
  - Basic skin condition, e.g. dryness, colour, temperature, fragility, fungal infection, hyperkeratosis
  - Lymphorrhoea – lymph leakage through the skin
  - Signs of acute infection, e.g. hot, painful red swelling with or without flu-like symptoms.
- The patient should be made aware of risk factors, signs and symptoms of cellulitis or lymphoedema and the appropriate action to take (see Box 12.4).
- The physiotherapist may be required to measure limb volumes and should follow local procedures and seek advice of an experienced colleague prior to carrying this out.
- Consideration must be given to other causes of oedema such as DVT, CCF, dependency, chronic venous insufficiency, recurrence of cancer, and other organ dysfunctions.
- A diagnosis of lymphoedema should necessitate a referral to local/regional lymphoedema services where a further more detailed assessment would occur.
- This would include staging (Table 12.2), specialist investigations, limb volumes, skin condition, presence of Stemmer's sign, skin folds, BMI, pain and psychosocial

less chance of recovering full motor function.

- It is only when spinal stability has been assessed and confirmed that the patient can start to sit up in bed with close monitoring for changes in neurology/symptoms (Table 12.3).
- If a patient shows any signs of deteriorating neurology they should be laid flat and a spinal surgery opinion sought.
- The physiotherapist must always work within their level of competency and seek further advice from senior staff as necessary (NICE 2008).
- Key aims of rehabilitation with MSCC patients during pre treatment stage:
  - Immobilization of spine
  - Baseline assessment of neurological function
  - Prevention of respiratory and/or circulatory problems
  - Pain relief
  - Maintenance of joint ROM
  - Education, information and support.

Table 12.3 Spinal cord compression checklist

Physiotherapist Introduction
Establishing patients knowledge and understanding
Assessment
Muscle charting
Sensation
Pain – neuropathic/mechanical
Tone
Range of movement
Dermatomes
Respiratory assessment
Aims for rehabilitation

Brain and spinal cord tumours

- There are two main types of brain tumour, primary and secondary (metastatic), they account for less than 2% of all cancer diagnoses in the UK.
- Within the group of primary brain tumours there are nearly 100 different types of tumour, generally named after the type of cell they developed from.
- The common descriptions of primary brain tumours are either 'benign' or 'malignant'.
- Benign tumours, although slow-growing and less likely to reoccur if removed, can still transform into more aggressive tumours, or cause significant damage dependant on their location. Malignant tumours, also known as 'high grade' tend to be faster growing and may spread further into the brain or spinal cord.
- Primary brain tumours very rarely spread outside the central nervous system.
- The common types, grading and prognosis of brain tumours are listed in Appendix 12.6.

- Patients can present with a variety of symptoms dependent on the type, location and nature of the tumour.
- Patients also have the potential to change very quickly, particularly the high-grade primary brain tumours.
- Intradural spinal cord tumours are rare and are classified as extramedullary (arising inside the dura but outside the spinal cord) or intramedullary (originating in the spinal cord).
- The most common extramedullary tumours are schwannomas and meningiomas, with ependymomas and astrocytomas arising from the cord itself.
- Primary lymphoma is another extramedullary tumour, but is extremely rare.
- Spinal tumours can often present with a protracted history of pain and associated neurological dysfunction below the level of the tumour.
- Physiotherapists working in a musculoskeletal setting may encounter such patients pre-diagnosis and need to be aware of red flags (Appendix 12.2).
- High-grade tumours in the cord carry a poor prognosis with an average life expectancy of between 6 and 12 months (NICE 2006).
- Low-grade tumours may have a better outlook in terms of longevity, although they will often have resulting disability and functional problems.

Assessment

- Assessment will depend on the patient's condition and the setting, but should include a neurological assessment, particularly in the acute setting after surgery (if applicable) to obtain baseline measurements.
- In other settings, or at different stages of the pathway, it may be more appropriate to focus on a functional assessment of movement and ability, dependent on the individual patient.
- Patients with a brain or spinal cord tumour should be assessed as any other neurologically presenting patient (such as CVA) but taking into consideration that the patient may fatigue more quickly and the assessment may need to take place over several sessions.
- These patients may also be suffering from increased levels of pain and this must be taken into account in planning the assessment.

Plexopathy

- Tumour infiltration as a result of disease progression and radiation injury are the most common causes of plexopathy in oncology and palliative care (Reddy 2006).
- Symptoms include pain, loss of motor control, sensory deficits and an overall deterioration in function.
- Brachial plexopathy is most commonly associated with lymphoma, and breast and lung cancers. Pain is the predominant presenting feature, often preceding the onset of focal

neurological signs by several months.

- Tumour invasion of the lower cords is more common, e.g. Pancoast syndrome (due to apical lung cancer), than invasion of the upper cords, giving rise to neurological signs and symptoms in the distribution of C8 to T1 roots.
- Radiation injury is more commonly associated with the upper cords.
- Lumbosacral plexopathy is often associated with genitourinary, gynaecological and colonic cancers. Pain varies with the site of plexus involvement. Radicular pain may present in the L1 to L3 distribution (anterior aspect of the thigh and groin) or in the L5–S1 distribution (posterior aspect of the leg to the heel). Sometimes, only referred pain is present, commonly in the anterior aspect of the thigh, the knee and the lateral aspect of the calf.

Peripheral neuropathy

- Peripheral neuropathy is usually caused by damage to nerves from surgery, radiation treatment, or chemotherapy.
- It can also be caused by a tumour pressing on or penetrating a nerve.
- Chemotherapy-induced peripheral neuropathy as a result of neurotoxicity is a complication most commonly associated with the cytotoxic drugs vinca alkaloids, platinum-based compounds and taxols, and the degree of reversibility is variable. The extent of neurological damage depends on the drug used, the duration of treatment and the cumulative dose applied (Quasthoff and Hartung 2002).
- Symptoms vary widely and may adversely affect quality of life.
- Patients may present with muscle weakness, distal paraesthesia, allodynia and muscle cramps.

Progressive neurological conditions

- Many patients will have palliative care needs, most commonly those diagnosed with more aggressive conditions, e.g. motor neuron disease (MND), multiple systems atrophy (MSA) or progressive supranuclear palsy (PSP).
- Patients with other conditions such as multiple sclerosis and Parkinson's disease may also access palliative care services towards the end of their disease process or if there are complex symptom management issues.

Assessment

- It is vital to assess the key functions that the patient may find difficult, such as bed mobility, toileting and hand function for eating and dressing, etc.
- With conditions such as MND, MSA and PSP the patients can deteriorate quickly and therefore reassessment at regular intervals is essential to provide optimum care.

- It is important to include family and carers in the assessment process, particularly if they will be providing care and assistance to the patient or they will be required to assist in physiotherapy programmes.

Pain

- Pain can be described as 'an unpleasant sensory or emotional experience associated with actual or potential tissue damage' (IASP 1994).
- It is a complex phenomenon being the culmination of several factors, physical or non-physical.
- A multidimensional, multiprofessional approach is needed to address the psychological, social and spiritual effects of pain.
- Physiotherapists have an important role to play in the management of this distressing symptom and should use a holistic, flexible, patient-focused approach, to conduct a comprehensive assessment and to implement treatment (Robb and Ewer-Smith 2008).
- The concept of total pain (Figure 12.1) was developed in the 1960s by Dane Cicely Saunders, emphasizing the multidimensional aspects of pain (Clark 1999).

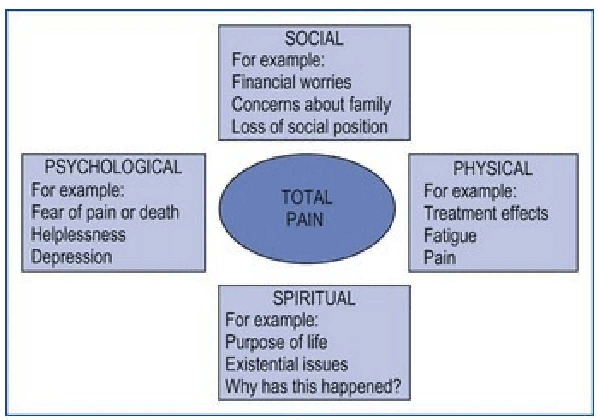

Figure 12.1 Total pain diagram.

Assessment

- A pain history will give insight into the background and the development of a patient's pain.
- It is important to differentiate between the assessment and measurement of pain.
- Assessment is 'the broader examination of the relationship between different components of the pain experience, for a given patient', whereas measurement is 'the quantification of each component' (Strong et al 2002).
- The essential components of a physiotherapy assessment include a description of the pain, responses to the pain and the impact of the pain on a patient's life. The latter can

be assessed by exploring functional limitation and physical impairments.

- Assessment is unlikely to take place in a single interaction, but information is usually gathered over a series of patient contacts.
- A holistic pain assessment should include medical and psychosocial history (including recognition of spiritual, cultural and religious aspects).
- Throughout the assessment and subsequent treatment, physiotherapists must remain vigilant for 'red flags' which may indicate disease progression (Appendix 12.2).
- It is important to bear in mind that two thirds of cancer patients have more than one pain and a third have three or more pains (Twycross 2003).
- Assessment will assist the identification of priorities and the goals of treatment, interventions recommended and likely outcomes with timescales.
- Any likely adverse effects of treatment should be clearly explained to the patient.
- The use of a pain diary may provide insight into:
  - The nature of the pain, e.g. neuropathic
  - The characteristics of the pain, e.g. location, duration, radiation, severity, constant/intermittent
  - Diurnal variations
  - Triggers
  - Aggravating activities and impacts on lifestyle
  - The impact of psychological and spiritual factors
  - Medications taken/other treatments tried/positional adjustments and their effects.

Range of movement (ROM) problems

- Decreased joint range can be caused by surgery, side effects from treatment, de-conditioning or the disease itself.
- Assessment may be required for a specific problem, e.g. a shoulder or neck following breast surgery.
- In the case of the palliative patient the assessment of ROM may take place through functional movements and/or mobility assessment when pain is controlled.

Assessment

- There are many factors to consider when carrying out a routine assessment of ROM.
- These include tissue extensibility, muscle shortening, spasms, scarring, radiation fibrosis, cording and any other presenting symptoms (Figure 12.2).
- Some of these symptoms may limit assessment and may need addressing before the physiotherapist can fully evaluate potential.

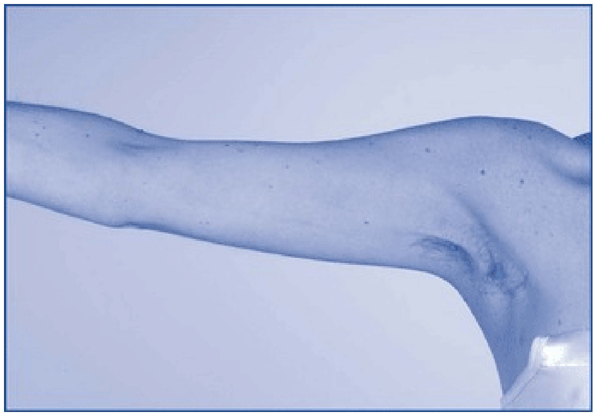

Figure 12.2 Cording in the upper limb.

Psychological aspects

Anxiety and depression

- Fear and anxiety are normal reactions to the stress of undergoing cancer treatment.
- Depression is when a patient's mood is low most of the time for several weeks or more. The relationship between cancer and depression is complex and multifactorial.

Assessment

- It is important to be aware of the issues of anxiety and depression in order to identify patients who may need referral on to a specialist.
- Common presentations can be; breathlessness, muscle tension, dizziness, sweating and panic attacks.
- Depression can express itself in a patient who has no motivation, expresses helplessness or hopelessness or guilt and blame.
- Anxiety and depression assessment scales are used, e.g. Hospital Anxiety and Depression Scale (HADS) or Brief Edinburgh Depression Scale (BEDS).
- Both provide a method of screening for anxiety and depression (Appendix 12.3).

Body image

- This is our own impression of our physical appearance and what sort of person we feel we are. This image is built up over time from observing ourselves, the reactions of others, and a complex interaction of attitudes, emotions, memories, fantasies and experiences (Regnard and Kindlen 2002).
- Our body image is also affected by social interactions and how we relate to others, our

feelings of achievement and self worth, our sexual image of attractiveness and our spirituality and morality.

- Cancer and its treatment can produce temporary and permanent changes which can have a devastating effect on patients' feelings and their attitude towards their body, which can affect their psychological health.

Assessment

- Physiotherapists should be aware of body image issues.
- Listening to a patient's concerns is of paramount importance. Often an open discussion and acknowledgement can bring down barriers, reduce feelings of isolation and fear of rejection.
- Referral to formal body image services or psychological support may be required and should be a MDT decision (Appendix 12.3).

Hope

- 'A multidimensional dynamic life force, characterized by a confident yet uncertain expectation of achieving future good, which, to the hoping person is realistically possible and personally significant' (Dufault and Martocchio 1985).
- Fostering hope and preventing feelings of abandonment are part of the physiotherapeutic intervention (Doyle et al 2005).
- Patients need attainable goals to help maintain a sense of control and to reframe a vision for the future. Some patients choose to avoid receiving information in order to maintain hope.
- Honesty, empathy, optimism and excellent communication skills are required to assist the patient.
- Kylma et al (2009) identified key factors contributing to and threatening hope in palliative care (Table 12.4).

Table 12.4 Hope, supporting factors and threats

Factors supporting hope	Factors threatening hope
Attainable goals that help to maintain a sense of control	Physical or emotional loss
Affirmation of worth	Losing the future
Honest information	Loss of healthcare professional's interest
Symptom management	Devaluation of personhood
Trust in care	

Specific issues related to tumour sites

• Issues or symptoms related to the common tumour sites types are shown in Table 12.5.

Table 12.5 Issues related to specific tumour sites

Symptoms	Breast	Head & Neck	Lung	Colorectal	Upper GI	Gynaecology	Brain/ CNS	Sarcoma	Haematology	Skin	Urology
Bleeding			✓	✓	✓				✓		
Body image	✓	✓		✓			✓	✓		✓	
Continence						✓					✓
Facial swelling		✓					✓				
Fatigue	✓		✓			✓	✓		✓		
Lymphoedema	✓	✓				✓					
Muscle strength	✓			✓			✓	✓			
MSCC	✓										✓
Nutritional problems		✓	✓	✓	✓				✓		
Osteoporosis risk	✓										✓
Pain	✓	✓					✓				
Posture problems	✓	✓					✓				
Radiation fibrosis	✓	✓	✓								
Respiratory complications		✓	✓								
Scarring	✓	✓								✓	
Sexual function						✓	✓				✓
Shoulder dysfunction	✓	✓									
Stiffness	✓	✓									

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Chapter 12

E-materials

Author profiles

Kate Baker BSc(Hons) MCSP

Kate qualified from Nottingham University School of Physiotherapy in 2003. After completing her junior rotations in Cardiff she worked as a senior physiotherapist in respiratory until the opportunity arose to apply for a full time position at Cardiff's regional cancer centre, Velindre Hospital. It was here she specialised in oncology and palliative care and she now currently leads the physiotherapy inpatient and outpatient team. Her areas of specialism lie in breast, head and neck cancers.

Kate is an executive member of the Association of Chartered Physiotherapists in Oncology and Palliative Care (ACPOPC) and is currently the treasurer. She has recently completed her foundation in acupuncture course and is enjoying the challenges and opportunities that this has brought.

Karen Livingstone GradDipPhys MCSP

Karen Livingstone is a clinical specialist physiotherapist working in Oncology and Palliative care for both St Ann's Hospice, Manchester, and the University Hospital of South Manchester.

She has extensive experience with over 14 years in rehabilitation in the cancer field and has been involved locally and nationally in lecturing and education. A published author in several book chapters she also is participating in national research in exercise, lymphoedema

and breast cancer and was runner up in the Princes Trust Integrated Health Awards for Fatigue Management in Cancer care.

Aileen McCartney MSc BSc(Hons) MCSP

Aileen is a specialist physiotherapist working at the Wisdom Hospice in Rochester, Kent. Aileen has been working in specialist palliative care for 5 years. She completed her MSc in Supportive and Palliative Care in 2010 focusing on rehabilitation for primary brain tumours. The results of her dissertation were published in Palliative Medicine in 2011.

Aileen is currently the education and research officer for the Association of Chartered Physiotherapists in Oncology and Palliative Care.

Siobhan O'Mahony PG Dip Health Services Management GradDipPhys MCSP

Siobhan O'Mahony qualified from the New University of Ulster at Jordanstown, Belfast in 1982. Having spent three and a half years rotating through the specialities as a junior physiotherapist, in the Royal Victoria Hospital, Belfast, she moved to Cork in 1986, and was

appointed to the position of senior physiotherapist in neurology and rehabilitation in Cork University Hospital.

In 1991, she took up a position at the Mercy Hospital, Cork, leaving in January 1998 to set up a new specialist palliative care physiotherapy service at Marymount Hospice in Cork, where she is currently the physiotherapy manager.

In 2004, she completed a post-graduate diploma in Health Services Management at the University of Limerick.

Having been a member of the Association of Chartered Physiotherapists in Oncology and Palliative Care (ACPOPC) since 1998, she joined the Executive Committee in 2007, and is currently the secretary.

Appendix 12.1 Normal blood values

Haematology

- Platelet count – normal range 150–00 × 10^9/L
- White blood cell count (WBC) – normal range 4–11 × 10^9/L
    - Basophil granulocytes – normal range <0.01–0.1 × 10^9/L
    - Eosinophil granulocytes – normal range 0.04–0.4 × 10^9/L
    - Lymphocytes – normal range 1.5–4.0 × 10^9/L
    - Monocytes – normal range 0.2–0.8 × 10^9/L
    - Neutrophil granulocytes – normal range 2.0–7.5 × 10^9/L

Biochemistry

- Potassium – normal range 3.5–5.0 mmol/L
- Sodium – normal range 135–146 mmol/L
- Urea – normal range 2.5–6.7 mmol/L/normal range 8–25 mg/dL

• Phosphate – normal range 0.8–1.5 mmol/L

Adapted from Kumar & Clark 2002.

Appendix 12.2 Red and yellow flags

Yellow flags	Red flags
Yellow flags are pyschosocial factors shown to be indicative of long-term chronicity and disability Negative coping strategies Poor self-efficacy beliefs Fear-avoidance behaviour Distress Attitude that back pain is harmful or potentially severely disabling Reduced activity levels An expectation that passive, rather than active, treatment will be beneficial A tendency to depression, low morale, and social withdrawalSocial or financial problems	Red flags are possible indicators of serious spinal pathology, urgent medical advice should be sought Constant pain, day and night Multiple nerve root pain Progressive neurological deficit Bladder or bowel dysfunction Reduced anal tone, saddle anaesthesia Unexplained weight loss Use of systemic steroids Thoracic pain Fever History of carcinoma Age of onset <20 years or >55 years Ill health or presence of other medical illness Disturbed gait

Appendix 12.3 Outcome measures

Fatigue references

Fatigue Symptom Inventory (FSI)

Measures

The FSI is a 14-item measure that assesses the severity, frequency, and diurnal variation of fatigue, as well as its perceived interference with quality of life, resulting from fatigue over the previous 7 days.

Reference

Hann, D.M., Jacobsen, P.B., Azzarello, L.M., et al., 1998. Measurement of fatigue in cancer patients: Development and validation of the Fatigue Symptom Inventory. Quality of Life

Research 7, 301–310.

Brief Fatigue Inventory (BFI)

Measures

The Brief Fatigue Inventory (BFI) consists of nine questions rated on an 11-point, Likert scale. It measures the severity of fatigue, over the previous 24-hour period.

Reference

Mendoza, T.R., Wang, X.S., Cleeland, C.S., et al., 1999. The rapid assessment of fatigue severity in cancer patients: Use of the brief fatigue inventory. Cancer 85 (5), 1186–1196.

Cancer Fatigue Scale (CFS)

Measures

The CFS is a 15-item scale composed of three subscales (physical, affective and cognitive subscales).

Reference

Okuyama, T., Akechi, T., Kugaya, A., et al., 2000. Development and validation of the Cancer Fatigue Scale: a brief, three-dimensional, self-rating scale for assessment of fatigue in cancer patients. Journal of Pain and Symptom Management 19 (1), 5–14.

Revised Piper Fatigue Scale (RPFS)

Measures

The Revised Piper Fatigue Scale (RPFS) is a 22-item, 10-point self-report scale that measures overall fatigue and four fatigue dimensions: temporal, severity, affective, and sensory, which are currently being experienced.

Reference

Piper, B.F., Dibble, S.L., Dodd, M.J. et al., 1998. The revised Piper Fatigue Scale: psychometric evaluation in women with breast cancer. Oncology Nursing Forum 25 (4), 677–684.

Multi Dimensional Symptom Inventory (MDSI-SF)

Measures

The Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF) consists of 30 statements designed to assess the multidimensional nature of fatigue.

The MFSI-SF can be completed in a wide variety of settings in about 5 minutes and focuses on the subjective experience of fatigue. It evaluates the general, mental, and physical dimensions of fatigue, as well as levels of motivation and activity.

Reference

Stein, K.D., Jacobsen, P.B., Blanchard, C.M., Thors, C.T., 2004. Further validation of the Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF). Journal of Pain and Symptom Management 27, 14–23.

Functional Assessment of Cancer Therapy Fatigue (FACT-F)

Measures

FACT-F is a 5-point Likert scale. It contains 13 items, which attempt to identify the intensity of fatigue experienced, during the previous 7-day period.

Reference

Cella, D. 1997. The Functional Assessment of Cancer Therapy-Anemia (FACT-An) Scale: a new tool for the assessment of outcomes in cancer anemia and fatigue. Seminars in Hematology 34 (3 Suppl 2), 13–19. http://www.facit.org/

Schwartz Cancer Fatigue Scale (Revised)

Measures

Is a 6-item 5-point rating scale, which attempts to examine cancer related fatigue over both physical and perceptual dimensions and relates to fatigue experienced over the past 2–3 days

Reference

Strickland, O.L., Dilorio, C. (Eds), 2003. Swartz Cancer Fatigue Scale in measurement of nursing outcomes, second ed. Springer, London.

The Multidimensional Fatigue Inventory (MFI)

Measures

Multidimensional Fatigue inventory designed to measure fatigue. It covers the following dimensions: General Fatigue, Physical Fatigue, Mental Fatigue, Reduced Motivation and

Reduced Activity; is a 20-item self-report instrument.

Reference

Smets, E.M.A., Garssen, B., Bonke, B., De Haes, J.C.J.M., 1995. The multidimensional fatigue inventory (MFI) psychometric qualities of an instrument to assess fatigue. Journal of Psychosomatic Research 39 (3), 315–325.

Pain references

Visual analogue scale (VAS)

Measures

A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude, that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain.

Reference

Gould, D., Kelly, D., Goldstone, L., Gammon, J., 2001. Examining the validity of pressure ulcer risk assessment scales: developing and using illustrated patient simulations to collect the data. Visual Analogue Scale. Journal of Clinical Nursing 10 (5), 697–706.

Numerical Rating Scale

Measures

The Numerical Rating Scale is an 11-point, self-reporting scale. This scale which ranges from zero to 10, assigns a measurable number to the level of pain experienced. Zero represents no pain at all while 10 represents the worst imaginable pain.

Reference

Krebs, E.E., Carey, T.S., Weinberger, M., 2007. Accuracy of the Pain Numeric Rating Scale as a screening test in primary care. Journal of General Internal Medicine 22 (10), 1453–1458.

Anxiety and depression references

Hospital Anxiety and Depression Scale (HADS)

Measures

The Hospital Anxiety and Depression Scale (HADS) is a questionnaire that gives indications to the levels of depression and anxiety of a person.

Reference

Zigmond, A.S., Snaith, R.P., 1983. The Hospital Anxiety and Depression Scale. Acta Psychiatrica Scandinavica 67 (6), 361–370.

The Brief Edinburgh Depression Scale (BEDS)

Measures

This is a six-item, self-reporting scale, which is a brief and sensitive method of screening for depression in advanced cancer patients.

Reference

Lloyd-Williams, M., Shiels, C., Dowrick, C., 2006. The development of the Brief Edinburgh Depression Scale (BEDS) to screen for depression in patients with advanced cancer. Journal of Affective Disorders 99 (1–3), 259–264.

Body image references

The Body Image Quality of Life Inventory (BIQLI)

Measures

The Body Image Quality of Life Inventory (BIQLI) uses a 7-point response format ranging from very negative (−3) to very positive (+3) effects of body image on 19 life domains.

Reference

Cash, T.F., Fleming, E.C., 2002. The impact of body-image experiences: Development of the Body Image Quality of Life Inventory. International Journal of Eating Disorders 31, 455–460.

The Situational Inventory of Body-Image Dysphoria (SIBID)

Measures

The Situational Inventory of Body-Image Dysphoria (SIBID) is an assessment of the

frequency of negative body-image emotions across specific situational contexts. This inventory asks respondents how often they experience body-image dysphoria or distress in each of 48 identified situations – including both social and nonsocial contexts and activities related to exercising, grooming, eating, intimacy, physical self-focus, and appearance alterations. A short-form of the SIBID (SIBID-S) contains 20 items.

Reference

Cash, T.F., 2002. The Situational Inventory of Body-Image Dysphoria: Psychometric evidence and development of a short form. International Journal of Eating Disorders 32, 362–366.

The Body-Image States Scale (BISS)

Measures

The Body Image States Scale (BISS) is a six-item measure of individuals' evaluation and affect about their physical appearance at a particular moment in time.

Reference

Cash, T.F., Fleming, E.C., Alindogan, J., Steadman, L., Whitehead, A., 2002. Beyond body image as a trait: The development and validation of the Body Image States Scale. Eating Disorders: The Journal of Treatment and Prevention 10, 103–113.

Appendix 12.4 Common side effects from treatment

Surgery

All surgical procedures can have potential post operative risks of pain, wound infection, DVT, swelling, chest infection and fatigue. Long-term problems from oncological surgery may include neuropathic pain, lymphoedema, complex scarring, altered muscle function and body image issues, which may be more challenging to the newly qualified physiotherapist.

Chemotherapy

Chemotherapy treatment can be administered by a wide variety of methods and with different aims and outcomes. The type of drug, schedule of treatment and dosage is a careful balance against the both the expected outcome of treatment and potential side effects regardless whether the aim is for cure, disease control or quality of life. Tissues with the

highest proliferation rate are commonly affected by chemotherapy, i.e. mouth, digestive system, skin, hair, and bone marrow.

Mouth

Often starts 5–10 days after treatment cycle and can give sore or dry mouth, ulcers, increased risk of infections particularly fungal, e.g. thrush.

Digestive system

Nausea, vomiting, or diarrhoea may occur within a few hours of treatment or not occur for several days. Some chemotherapy can give heartburn or constipation.

Skin

Skin may become dry, discoloured, or more sensitive to sunlight and nail growth may be affected. Plantar palmar syndrome where hands and soles of feet become red, dry and painful is a complication of some drugs.

Hair

Some but not all drugs cause alopecia, usually within the first few weeks of treatment.

Blood and bone marrow

Chemotherapy commonly causes acute myelosuppression. Anaemia causes breathlessness, tiredness and muscle fatigue and may require transfusion, or red blood cell growth factors such as erythropoietin.

Leukopenia – a decrease in white cell count will mean the patient is more susceptible to infection. Neutropenia – a subtype of leukopenia – is a greater indicator of infection risk. It is vital that the patient and physiotherapist are aware of symptoms of infection (i.e. raised temperature, sore throat, cough, breathlessness, pain passing urine, or any redness or swelling such as round a central line); the patient must seek urgent medical advice. Infection left untreated can rapidly develop into septicaemia in these patients. Treatment involves regular injections of growth cell factors such as G-CSF (granulocyte colony-stimulating factor), which can in itself give bony pain.

Thrombocytopenia (low platelet count) will mean the patient bruises more easily and bleeds more than usual and may experience pain and swelling as a result. If the count is too low the patient may require a platelet transfusion.

Other more long-lasting side effects

Fatigue, sleep disturbance, infertility, peripheral neuropathy, pneumonitis, pulmonary fibrosis, liver or kidney dysfunction, cardiomyopathy or cardiac arrhythmias, haemorrhagic cystitis, tinnitus, psychological issues and body image concerns.

Steroids are used in chemotherapy for acute symptom relief but can give mood swings. Longer-term use can lead to osteoporosis, myopathies, diabetes, and Cushingoid symptoms.

Radiotherapy

Side effects will depend on the mode of treatment, dose and surface area treated.

Initial side effects

Fatigue is common, often starting within a week of treatment commencing, and can persist for weeks.

Skin will inflame initially but can become dry, scaly and itchy. Skin can break down (moist desquamation) and blisters can occur. This is more likely with sensitive skin recently traumatised, as in surgery or infection. Skin reactions usually settle within 2–4 weeks following treatment.

Other side effects are dependent on the area of the body treated:

- Skull and brain – alopecia, cerebral oedema, restlessness, irritability, headache, nausea.
- Head and neck – mucositis, destruction of salivary glands, taste changes, pharyngitis, oesophagitis.
- Chest/upper back – oesophagitis, pneumonitis, indigestion, nausea.
- Abdomen and lower back – nausea, vomiting, diarrhoea, cystitis, infertility.
- Flat bones – acute myelosuppression.

Longer-term side effects

Lung fibrosis, cardiac dysfunction, tissue fibrosis, lymphoedema.

Hormone therapies

Hormone therapies such as: anti-oestrogens; luteinising hormone releasing hormone agonists; oestrogen receptor down-regulators; aromatase inhibitors may result in hot flushes, dizziness, mood swings, nausea, headaches, arthralgia, increased risk of thrombosis, retinopathy, osteoporosis, ca uterus in women and gynaecomastia in men. Immunosuppressant therapies, angiogenesis and gene therapies are relatively new therapies aimed at reducing blood flow and stimulating the immune system.Side effects include immunodeficiency, hypertension and infections.

Appendix 12.5 Neurological assessment

Assessment of the upper limb

Nerve root	Dermatomes	Myotomes	Reflex
C1	Superior head	Breathing	
C2	External occipital	Cervical flexion	
C3	Neck	Cervical side bending	
C4	Traps/lateral neck	Scapula elevation	
C5	Lateral arm/deltoid	Shoulder abduction	Biceps
C6	Lateral forearm/ thumb/index finger	Elbow flexion and wrist extension	Brachioradialis
C7	Middle finger	Elbow extension/ wrist flexion/finger extension	Triceps
C8	4th and 5th finger/ medial forearm	Finger flexion and thumb abduction	Triceps
T1	Medial arm/axilla	Finger abduction and finger adduction	

Assessment of the lower limb

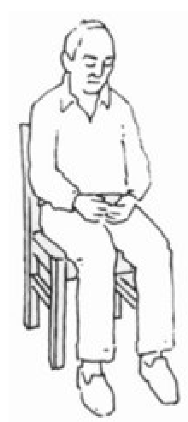
Nerve root	Dermatomes	Myotomes	Reflex
L1	Groin	Hip flexion	
L2	Thigh	Hip flexion	
L3	Superior patella	Knee extension	
L4	Medial tibia/medial arch	Dorsiflexion and inversion	Patellar tendon
L5	Dorsal and lateral foot	Big toe extension	
S1	Plantar aspect of foot	Ankle plantarflexion	Achilles
S2	Posterior thigh	Knee flexion	
Plantar response	+ve = upgoing 1st toes and abducting toes 2–5		

Appendix 12.6 Common primary brain tumours

Tumour	Grade	Prognosis
Anaplastic astrocytoma	III	5 year survival 10%
Glioblastoma multiforme	IV	11 months from diagnosis 5 year survival 6%
Anaplastic oligodendroglioma	III	5 year survival 30–38%
Anaplastic ependymoma	III	2–3 year survival on average 5 year survival 10–50%
Low-grade meningioma	II	5 year survival >80%
High-grade meningioma	III	5 year survival <60%
Acoustic neuroma	I/II	Usually curable
Pituitary tumours	II	5 year survival >82%

Cancer Research UK, 2008.

Appendix 12.7 Positions of ease for breathlessness



Case Study 12.1

Background

- Ms K was a 60-year-old lady who was admitted to a cancer centre with suspected metastatic spinal cord compression from her GP in January.
- She had a 3/12 history of worsening lower limb weakness with a recent history of two falls.
- She also had a 3/7 history of urinary retention.
- An MRI scan confirmed a cord compression at T8.
- On admission she was commenced on high-dose steroids and advised to remain on strict flat bed best.
- She was planned for radiotherapy, five fractions over a 5-day period.
- Radiotherapy however didn't commence at this time as the physiotherapists assessed her neurology, sat Ms K up in bed from 0–60° over a gradual period while monitoring for changes in symptoms.
- Ms K had increasing pain and worsening right leg hip flexion indicating spinal instability.
- Surgical opinion was sought and Ms K was transferred to a local district general hospital under an orthopaedic team for decompression and debulking of T9.
- Ms K returned to the cancer centre post operatively for her five fractions of radiotherapy.
- From the baseline neurological assessment and throughout treatment Ms K had significantly reduced lower limb power and was therefore transferred to a rehabilitation unit from the cancer centre 3 days after finishing radiotherapy.

Previous medical history

- She had a history of left breast carcinoma 9 years ago and a recurrence in her right breast 4 years ago.
- Ms K had no living relatives but had a few close friends and lived alone in a single-storey

- As Ms K identified that her quality of life was intractably linked to her independence, achieving wheelchair mobility was her primary goal.
- She progressed to active-assisted movements of her lower limbs and standing in the parallel bars.
- Improvements in hip extension and trunk control allowed Ms K to take a few steps, which helped her to regain her locus of control.
- Following a home visit with Ms K, a physiotherapist from the rehabilitation centre and a community occupational therapist, she was discharged from the centre in July.
- Weekly physiotherapy sessions were arranged at the acute hospital and frequent progress reports were made to the palliative care team.
- Ms K continued to attend the hospice day care centre three times a week for ongoing monitoring, support and socialising.
- She was also reviewed by the orthopaedics who were pleased with her progress and discharged her from their care.
- By November, Ms K was walking with a Zimmer frame and by December, she was mobile with a stick.
- Initially, the multidisciplinary team felt that it was highly unlikely that Ms K would walk again, yet Ms K managed to live independently at home and continues to do so.
- Continually reassessing the patient, looking for opportunities for improvement and renegotiating goals are an essential part of physiotherapy treatment planning.
- For many patients, maintenance of hope is paramount. To quote Ms K 'If I lose hope, I lose the battle'.

Case Study 12.2

Background

- Mrs C was a 45-year-old lady who was referred for outpatient physiotherapy from her GP with pain, stiffness and tightness affecting her left chest, shoulder and arm.
- She had a previous diagnosis of invasive ductal carcinoma of the left breast, which was initially treated twelve months previously, with a wide local incision (WLE) and sentinel node biopsy (SNB) whereby two lymph nodes were removed and found to be affected.
- The tumour was identified as grade III aggressive, and strongly oestrogen receptor positive.
- Three weeks following her initial surgery she went on to have a left axillary node clearance (ANC) of 22 nodes one of which was found to be affected by the cancer.
- Her surgery was followed by 6 cycles of intravenous chemotherapy which she tolerated reasonably well and 15 fractions of radiotherapy to the left chest and axilla which was completed 4 months prior to accessing physiotherapy.
- Mrs C had been started on Tamoxifen hormone therapy on completion of her

chemotherapy.

Previous medical history

- Mrs C had had 2 previous caesarean sections but had otherwise had previous good health.
- She was married with 2 children, both girls under the age of 10, and was a part-time teaching assistant.

Assessment

- Mrs C presented with reduced left shoulder mobility particularly flexion, abduction and external rotation.
- She had two well-healed scars, one superior to the left nipple and the other in the left axilla which appeared to be adhered and there was tight clavipectoral fascia.
- There were visible spot tattoos encircling the radiotherapy field.
- Posture was affected with protraction of the left scapula and associated left trapezius spasm.
- Mrs C reported she had good range of movement after her initial surgery but had first noticed stiffness in her shoulder following the ANC.
- She had felt increasing tightness in her left chest over the last 2 months and was having trouble finding a comfortable bra.
- She expressed fears for the future, of recurrence for herself and for her children's risk of developing breast cancer.

Treatment

- The aims of treatment were to
  - Mobilise the shoulder
  - Improve the scar and achieve good extensibility of tight fascia
  - Re-educate posture
  - Teach good skin care and lymphoedema prevention
  - Liaise with the breast care nurse for support with fears for the future and body image concerns.
- Mrs C attended for five sessions and was taught a home exercise programme, which included progressive shoulder mobilisation and stretching exercises and self scar massage.
- This also included a skin care programme applying a cream to the affected arm and shoulder in a manner to support the lymphatic system.
- Her treatment programme included mobilisation of the shoulder, myofascial release, postural exercises and lymphoedema prevention advice.
- Importantly, during the treatment sessions she was also able to identify areas of concern

with body image, day and night sweating and her fears about the cancer returning.

- She was encouraged to talk to her oncology team about her concerns of recurrence, and possible risks for her daughters and an appointment with her breast care nurse was facilitated to address menopausal symptoms and bra fitting.
- On discharge Mrs C had regained her range of movement and was much more confident.
- She was reassured regarding future activity and planned to join a local combined Pilates and Yoga class.

Case Study 12.3

Background

- Mr J was a 45-year-old man recently diagnosed with motor neuron disease (MND). He was married with three young children.
- He had worked as an accountant, but over the previous 2 years his presenting symptoms of upper limb weakness and speech difficulties had meant he had to give work up.
- He had been seeing a number of neurologists over these 2 years until the diagnosis of MND was finally made.
- Mr J was referred to the specialist palliative care service in September for management of symptoms and psychosocial support for him and his family.

Previous medical history

- He had no previous history of illness and in fact had been a very active man, taking part in competitive running.

Assessment

- Mr J and his wife were devastated by the diagnosis although expressed relief in some ways that at least they now had a named condition.
- Mr J had significant upper limb weakness, worse distally than proximally with no active movement in his fingers, thumb or wrists, grade 1 power in his biceps and triceps and grade 2 power in his shoulder.
- Therefore he had no real functional use of his upper limbs.
- This meant he was completely reliant on his wife for assistance with all daily activities, something they were both finding difficult to cope with.
- Mr J remained mobile and the strength in his lower limbs was normal at this stage. Mr J had a speech impairment although communication was still possible and his speech was understandable.

- Mr J was already seeing the speech and language therapist attached to the palliative care service.

Treatment

- Physiotherapy treatment commenced with teaching Mrs J how to do passive and active assisted movements for Mr J's upper limbs.
- Advice was also offered on positioning and support for his limbs.
- Due to discomfort when walking it was decided to also trial shoulder supports for both arms to reduce the shoulder subluxation due to weakness and muscle loss. Preventative advice was also given regarding respiratory care through deep breathing exercises.
- A referral was made to the occupational therapist for support for daily activities and equipment provision.
- By December Mr J's speech had deteriorated further and he was having difficulty managing his secretions.
- Alongside the speech therapist, advice was given on secretion clearance techniques and other methods to manage secretions.
- At this time Mr J had also begun to experience some lower limb weakness although he was still mobile.
- Mr J's treatment was managed as part of a multidisciplinary team, with his management plan discussed monthly at the MND meeting.
- He had regular input from the consultant, clinical nurse specialist, physiotherapist, occupational therapist and speech and language therapist.
- The whole family had regular support from a social worker and a welfare advice officer.
- The children also saw a social worker individually and through this were able to express their feelings and communicate well with their father.
- Through this Mr J was also able to make memory boxes for each of his children. This multidisciplinary approach was essential in managing a rapidly changing condition that impacted on every aspect of Mr J's life.
- In February Mr J developed a chest infection and was admitted to the acute hospital for treatment.
- At this stage it became clear that he was in the final stages of his illness and he was transferred to the inpatient unit at the hospice where he had always wanted to die.
- At this stage physiotherapy input was supportive, giving advice on positioning Mr J in bed to reduce his discomfort, gentle breathing and relaxation exercises when appropriate and support for his family.

  Three days after arriving at the hospice Mr J died with his family around him.

Chapter 12 Multiple choice questions

1. What are the most prevalent types of cancer in the UK?
   a). Breast, bowel, lung and prostate cancer

b). Non-Hodgkin's lymphoma, breast, ovarian and pancreas cancer
c). Multiple myeloma, stomach, kidney and bladder cancer
d). Lung, oesophagus, brain and liver cancer

2. The most common side effects of radiotherapy are ...
   a). Pain, depression and heart problems
   b). Hallucinations, insomnia and pain
   c). Constipation, increase in appetite and hair loss
   d). Skin problems, loss of appetite and fatigue
3. How are brain tumours classified and which is the most severe?
   a). Grades I–VI with Grade I being most severe
   b). Grades I–IV with Grade IV being most severe
   c). Level I–X with Level X being most severe
   d). Level I–V with Level I being most severe
4. A 70-year-old male presents with severe, constant low back pain, difficulty passing urine and numbness in his legs. He has a history of prostate cancer. What would you suspect?
   a). Bladder infection
   b). Return of prostate cancer
   c). Secondary bladder cancer
   d). Spinal cord compression
5. You are asked to rehabilitate a breathless patient with lung cancer. His mobility is limited only by SOBOE. What do you do?
   a). Discharge the patient; there is nothing you can do for this type of breathlessness
   b). Liaise with the OTs to ensure the patient is discharged to single-level living with commode downstairs
   c). Verbally encourage the patient to 'get through the problem'
   d). Use pacing and positions of ease to optimise his breathing
6. A lady has primary breast cancer and presents to the ward with LBP. The nurses ask you to assess her mobility. What do you do?
   a). Complete lumbar spine assessment including accessory movements
   b). Complete your data gathering including site of spread, then seek senior support
   c). Complete full mobility assessment
   d). Deem referral inappropriate, refer to outpatients and discharge
7. When would you consider a patient post peripheral blood stem cell transplant too thrombocytopenic for physiotherapy intervention?
   a). Platelets >100 and Hb >8
   b). Platelets <50 and Hb <8
   c). Platelets >50 and Hb >8
   d). There is no unsafe limit
8. What are the most common types of cancer that can lead to spinal cord compression?
   a). Brain, bowel and kidney cancer
   b). Stomach, liver and ovarian cancer
   c). Prostate, lung and breast cancer

d). Malignant melanoma, prostate and bowel cancer

9. Chemotherapy works best for …
   a). Breast, lung and bowel cancer
   b). Myeloma, lymphoma, leukaemia and testicular cancer
   c). Oesophagus, prostate and liver cancer
   d). Lymphoma, lung, breast and bowel cancer
10. A 55-year-old lady with brainstem glioma has been admitted for a 6-week course of radiotherapy. What side effects of radiotherapy are most likely to impact on your physiotherapy treatment?
    a). Fatigue
    b). Double vision
    c). Nausea and vomiting
    d). All of the above
11. A patient you have been treating for several weeks asks 'Am I dying?' Do you:
    a). Say 'no' and change the subject
    b). Reassure them the doctors are doing everything they can
    c). Say 'I don't know. Would you like me to ask someone to come and talk to you about this'
    d). Reply with a question to establish their understanding of their disease or their reason for asking
12. A patient with end-stage heart failure is referred to you for assessment; she is likely to die within the next week but wants to try to improve her mobility. What do you do?
    a). Tell nursing staff the referral is inappropriate and discharge
    b). Assess the patient but tell her there is nothing you can offer at this stage
    c). Assess the patient to identify her goals and together make a realistic plan for physiotherapy intervention
    d). Assess the patient and immediately instigate a daily mobility programme with exercise programme
13. What are the four aspects of the Total Pain Model?
    a). Financial, social, medical and spiritual
    b). Spiritual, physical, psychological and social
    c). Emotional, physical, financial and medical
    d). Physical, medical, social and spiritual
14. Which of these non-malignant conditions may be most appropriate for palliative care
    a). Motor neuron disease
    b). End-stage respiratory disease
    c). End-stage renal failure
    d). All of the above
15. Goal setting in palliative care should be
    a). Continually reviewed to effect a speedy discharge
    b). Continually reviewed against a background of the patient's changing condition
    c). Continually reviewed to make best use of available resources

d). Continually reviewed by the medical team

16. Malignant spinal cord compression is most commonly associated with
    a). The cervical spine
    b). The thoracic spine
    c). The lumbar spine
    d). The sacral spine
17. Brachial plexopathy is most commonly associated with
    a). Lymphoma, breast and lung tumours
    b). Primary brain tumours
    c). Melanoma
    d). Sarcoma
18. The most common presenting symptom of brachial plexopathy is
    a). Weakness
    b). Allodynia
    c). Pain
    d). Pruritis
19. Bone metastases are most commonly associated with which cancers
    a). Pancreatic, renal, lung and kidney
    b). Breast, prostate, renal and pancreatic
    c). Breast, prostate, lung and kidney
    d). Lung, renal, pancreatic and breast
20. In fatigue management, what are the five P's of energy conservation?
    a). Posture, perseverance, plan, permission and practice
    b). Perseverance, posture, permission, pace and prioritise
    c). Plan, pace, perseverance, practice and permission
    d). Plan, pace, prioritise, posture and permission

Multiple choice answers

1. a)
2. d)
3. b)
4. d)
5. d)
6. b)
7. b)
8. c)
9. b)
10. d)
11. d)
12. c)
13. b)
14. d)

15. b)
16. b)
17. a)
18. c)
19. c)
20. d)

Chapter 13

Pain Management

Introduction

Pain is a frequent part of everyday life with wide-ranging causes, e.g. unaccustomed activity/inactivity, bumps, bruises and indigestion, chronic disease or pain conditions. Pain may act as an acute internal warning, entering the consciousness insistently, or as a result of tissue damage.

Even premature babies have a fully functioning pain system and using morphine for their pain has a significant effect on morbidity and mortality. Heel stab and circumcision studies have demonstrated that the experience of early pain has a profound impact on future pain response (Goldschneider 1998).

Pain as a symptom is defined by the International Association for the Study of Pain (IASP) as 'an unpleasant and emotional experience associated with actual or potential tissue damage, or described in terms of such damage' (Merskey 1979). This encourages us to view pain as a complex perceptual experience that involves sensory-discriminative, affective-motivational and cognitive-evaluative components and not merely sensory information (Melzack and Casey 1968).

Wall (1989) described pain as a 'need state' in the way that hunger is, rather than a pure nociceptive sensation. Hunger drives the urge to find food, with relief of hunger being related more to expectations of the effect of eating rather than directly related to actual blood sugar levels.

Similarly, pain drives the urge to:

1. Escape from its cause: verified by the involvement of the motor cortex and cerebellum in pain processing. Movement strongly influences these controls from both the periphery and the brain. Wall (1995) suggested that 'the input may be better perceived in terms of the motor action which is appropriate, so that sensory and motor control are seen as two sides of the same coin', and (Wall 1999a Epilogue) 'pain is not just a sensation but … is an awareness of an action plan to be rid of it.'
2. Seek relief: this is supported by the fact that pain intensity is reduced in the presence of an intervention perceived as adequately effective in dealing with the cause, even if its actual therapeutic effect is zero (Wall 1999b). The placebo response can be powerful; the effect of sham surgery can last for 6 months or longer (Cobb et al 1959). Pain is the main driver for patients to present to health care establishments and the most frequent symptom encountered by health professionals.

Is the pain acute or chronic? Is there a difference?

Understanding pain as merely a signal of damage has hampered clinicians' and patients' views about how pain should be managed; clinicians and patients need to rethink what acute and chronic pain are. Moseley and colleagues have demonstrated that understanding what pain is has a significant real effect upon pain intensity and disability (Moseley et al, 2004).

Acute pain

Acute pain is defined as pain that occurs at the time and for a period following injury, disease process or acute ischaemia. Signals from damaged tissue are relayed to the central nervous system (CNS) via nociceptors and nociceptive neurons (Woolf and Ma 2004).

Upon reaching the CNS, nociceptive signals may be automatically modified by factors that demand attention. These include the perceived threat of the situation and injury, past experiences, genetic factors, environmental and cultural factors, expectations and beliefs (Moseley 2007). Nociceptive signal reduction can be such that major injuries can, for a period, be experienced as pain-free, allowing for defensive and escape behaviours (Fanselow and Sigmundi 1986, Wall 1999a Chapter 1). Some minor injuries though can seem disproportionately painful. The CNS, therefore, does not merely passively relay and receive information.

When acute conscious pain occurs it is also accompanied by widespread reactions: alertness, orientation, attention and exploration, changes to heart and breathing rates and blood pressure, sweating, slowing of gut motility and rising anxiety (Wall 1999a). This is not just to support 'flight and fight' but also to initiate seeking (appropriate) help. Acute pain then continues to quite a varying degree while the healing, autoimmune, ischaemic or infective inflammatory processes are on-going. Inflammatory processes or peripheral nerve damage produce further integration of the distinctive patterns of adaptive, neuronal changes in the CNS (Milan 1999). Changes in the thalamus and somatosensory cortex can lead to quite marked hypersensitivity, frequently mistaken for inflammation. Inflammation is usually fairly transitory, its limit for even major injuries being at most a week (Evans 1980). Such changes usually resolve when the nociceptive stimuli stop.

During this recovery period however, symptoms can still be aggravated by certain physical factors such as prolonged immobilisation at any stage, or over-use in the early stages. Emotional factors such as stress, anger, depression, anxiety and anticipation (Main et al 2008 Chapter 2) can also amplify symptoms; many areas of the brain involved in pain processing are also activated during the experience of emotions. Emotions of course will partly be driven by beliefs and expectations; something that physiotherapists can influence.

Chronic pain

Chronic pain is defined as pain that continues past the expected healing time or on-going pain (IASP 1994). An arbitrary time-frame of 3 months post onset/injury is a practical cut-off point for confirming the diagnosis of chronic pain since primary healing of all injury types will have been completed by then. Minor injuries (cuts, minor fractures, sprains) will have healed much faster and signs of chronicity can sometimes be picked up soon after injury:

- Mirror pains appearing on the contralateral limb.
- Sharp, shooting or stabbing pain.
- Burning pain.
- Feelings of swelling, stiffness, hot/cold.
- Colour changes.
- Paraesthesia/numbness.
- Feelings of ants crawling/water flowing/feels woody, etc.
- All movements hurt (not in normal distribution).
- Unpredictable.
- Pain has a 'mind of its own'.
- Pain increases with weather changes.

Fifty per cent of those with chronic pain remember no causative factors as the brain has the ability to generate a perception of pain without a nociceptive input (Tracey 2005). Chronic pain is distinguished from acute pain by the involvement of the pain system producing on-going central sensitisation (Sterner and Gerdle 2004).

These symptoms may present with acute pain and nerve damage, but there is an obvious injury and these resolve quickly.

Some patients with central sensitisation pain can have on-going perceptual problems, e.g. a limb feeling swollen when it is not, or is difficult to determine where it is, including sense of left/right and problems with discrimination (Lotze and Moseley 2007; Moseley 2004). Since these features were not recognised in the past, patients may have been worried that their problem was more serious than their health professionals considered it to be.

Episodic pain

Episodic (or recurrent) pain is a form of chronic pain. Many patients presenting with apparent acute low back pain (LBP), may be experiencing an episode of an on-going chronic problem which has not been precipitated by accidental damage. Much of the misunderstanding around 'damage' caused by lifting is due to poor knowledge about the strength of bones and ligaments, and what pain perception actually is: allodynia is a hypersensitivity state, not actual damage.

Physiotherapists will be aware of physical and lifestyle factors that can contribute to pain recurring without apparent injury: a stiff joint above/below, chronic muscle tension, post-immobilisation or inactivity, stress, depression, lack of refreshing sleep, smoking. However, all these states occur in pain-free individuals too, so their effect on individuals cannot be

linked with absolute certainty. Central hypersensitivity is the common factor.

Summary

Acute nociceptive pain will have a clear injury or disease-process cause, settling within the expected healing time. It requires assessment and treatment for the underlying cause, but also assessment and management of the pain sensation and those factors that increase its impact.

In chronic pain however, both patients and clinicians should realise that the main focus for assessing, understanding and treating the pain should be that it is primarily a problem of pain transmission and perception, i.e. a problem within the nervous system. The cause is not tissue-based any longer, whether or not the tissues were originally injured or have a role in the maintenance of the problem.

Many patients are mystified by their pain experience. Your assessment aids understanding, which will help them accept it as a normal response, understandable, and within their power to modify or cope with.

Key risk factors for chronic pain disability

The roles of musculoskeletal tissues and lifestyle factors in continuing pain are uncertain. However, somewhat more certain are the risk factors that contribute to chronic pain disability.

Most people who experience post injury pain have little hesitation in gradually reintroducing movements and activities. They may seek some reassurance or advice, but they generally manage recovery and rehabilitation instinctively and reasonably well. This is not always the case however, and until recently, the incidence of chronic pain disability was rising exponentially. Chronic pain and disability prevention is thus as important for acute pain as acute pain treatment. The importance of psychosocial factors in the development of these chronic problems has consistently been demonstrated (Shaw et al 2005) (Box 13.1).

Box 13.1 Early risk factors for chronic pain disability (adapted from Shaw et al 2005)

- Patients with increased pain affecting sleep despite analgesia
- Belief that pain is harmful or potentially disabling
- Fear avoidance behaviour from fear of pain or fear of harm/causing damage
- Catastrophising (thinking the worst)
- Low mood due to pain and the consequences of injury
- Expectation that passive treatments rather than active participation in therapy would help
- Patients not making expected improvements 2–4 weeks after treatment for an acute

(LBP) problem

- Patients who have significant difficulty with ADL or work, for more than 4 weeks (there is evidence for this factor for LBP and whiplash-associated disorders, but look for it with any pain)

It is important to consider the presence of risk factors for chronic pain disability – yellow flags – in every individual with acute pain, and assess these more thoroughly if they are suspected. Interventions can then be used to reduce the risk of disability, return patients rapidly to their usual level of fitness, and reduce the chances of acute pain becoming chronic.

Assessment for pain: different presentations, pain syndromes

Distinguishing acute nociceptive from chronic pain and assessing risk factors for chronic pain disability should be part of the standard assessment. Pain has different presentations, and requires assessment to distinguish the type of pain or pain syndrome. This will allow you to inform your patients of the known and unknown aetiology of their condition and provide appropriate intervention. It will ensure you avoid unhelpful advice and treatment which may lead patients to think that their problem is serious or unmanageable.

The IASP have produced referenced clinical updates on each of these pain syndromes (http://www.iasp-pain.org).

Neurogenic pain: slowly developing regional musculoskeletal or 'neuralgia-like' pains

These pains classically have no obvious causative injury. A period of unaccustomed work or activity may precede it, but recovery with paced activity would normally be expected to occur, but does not. A poor tolerance for static positions, for activity and/or stress of the body region, and reduced fitness of the whole body or body region ensues. Examples include syndromes such as repetitive strain disorder, epicondylitis, LBP and osteoarthritic pains which are becoming recognised as neurogenic pains and not tissue-based conditions (e.g. Laursen et al 2006). Comparing X-ray changes with normal subjects of similar ages shows little difference apart from pain hypersensitivity. Clear fMRI evidence is emerging of changes in the sensory cortex (Flor et al 1997). Neurogenic pain is not limited to the musculoskeletal system: some pelvic and bladder pains, chronic indigestion, irritable bowel and headaches are all now considered to be neurogenic pain. Such cases are often referred to non-pain specialists where focus on the painful tissues often leads to a poor outcome.

Neurogenic pain: chronic widespread pain and fibromyalgia syndrome (FMS)

FMS is a non-articular disorder of unclear aetiology characterised by widespread pain throughout the body. The commonly encountered features of FMS are listed in Box 13.2.

Box 13.2 Frequently reported features of fibromyalgia

- Widespread musculoskeletal pain, typically diffuse or multifocal
- Morning stiffness
- Joints or limbs feel swollen
- Headaches
- Temporomandibular joint dysfunction
- Irritable bowel syndrome; bladder disturbances; dysmenorrhoea
- Fatigue, reduced energy and drive
- Disturbed sleep; non-restorative sleep
- Problems with concentration, attention, or memory
- Mood disturbance

There are few long-term studies and none with disease controls, so findings cannot be verified as specific to FMS. Evidence is growing for genetic, environmental and lifestyle factors (e.g. obesity, reduced fitness and poor sleep) affecting susceptibility.

External events including trauma, a regional pain syndrome, psychological distress, emotional trauma or an acute illness may trigger these pains. Among psychosocial stressors, the workplace has been found to be a main contributor.

Recent FMS criteria proposed by the American College of Rheumatology (Wolfe 2010) introduced a 'Widespread Pain Index' and a 'Symptom Severity Score.' Clinical relevance however remains to be explored.

Neuropathic pain

This is spontaneous pain and hypersensitivity associated with primary injury or dysfunction of the nervous system following peripheral nerve or spinal cord trauma or where disease process has damaged peripheral nerves, e.g. shingles, diabetes, human immunodeficiency virus (HIV)/acquired immune deficiency syndrome, alcoholism, vasculitis and multiple sclerosis. Following stroke, spinal cord injury or syringomyelia, patients frequently develop neuropathic pain. Changes occur in peripheral afferents, causing ectopic discharges at the site of the injury, at any neuromas and at the dorsal root ganglion (Woolf 2004).

Self report questionnaires have been developed to evaluate the presence of neuropathic pain such as 'painDETECT' which was developed to assess the neuropathic components of

LBP (Freynhagen et al 2006) and the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) (Bennett 2001).

Chronic regional pain syndrome (CRPS)

CRPS begins as rapidly escalating post-injury pain. Genetic factors have been identified that predispose to the development of CRPS. The extent of mechanical hyperalgesia in CRPS has been correlated to the extent of cortical reorganisation assessed on fMRI (Pleger et al 2006).

There are two types of CRPS, both ranging from moderate to extremely severe pain, each with different causes:

- CRPS type I: following minor injuries or fracture of a limb.
- CRPS type II: following injury to a major peripheral nerve.

Reluctance to reduce protective behaviour or to move unless the pain is reduced, can quickly lead to a cycle of avoidance, increased pain, demands for help, increased fear of painful movements, muscle tension in many areas, and fear of the future.

Stiffness, on-going spasm and signs of developing CRPS emerge.

Recognition of early stage CRPS may follow the removal of a cast, e.g. post Colles fracture, where the patient holds the now healed wrist as if it is still fractured. The Budapest criteria can provide a helpful framework for defining a diagnosis of CRPS (Box 13.3).

Box 13.3 Budapest Clinical Diagnostic Criteria for CRPS (Harden et al 2010)

1. Continuing pain, which is disproportionate to any inciting event
2. Must report at least one symptom in three of the four following categories:
   - Sensory: reports of hyperaesthesia and/or allodynia
   - Vasomotor: reports of temperature asymmetry and/or skin color changes and/or skin color asymmetry
   - Sudomotor/oedema: reports of oedema and/or sweating changes and/or sweating asymmetry
   - Motor/trophic: reports of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)
3. Must display at least one sign at time of evaluation in two or more of the following categories:
   - Sensory: evidence of hyperalgesia (to pinprick) and/or allodynia (to light touch and/or deep somatic pressure and/or joint movement)
   - Vasomotor: evidence of temperature asymmetry and/or skin color changes and/or asymmetry
   - Sudomotor/oedema: evidence of oedema and/or sweating changes and/or sweating asymmetry
   - Motor/trophic: evidence of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)

4. There is no other diagnosis that better explains the signs and symptoms

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Quantitative sensory testing can be performed using von Frey hairs or Semmes–Weinstein filaments to assess whole body tactile thresholds and the extent of the allodynia, since some patients with CRPS develop contralateral or widespread remote symptoms (http://www.ugobasile.com/media/catalogue/products/leaflets/37450-277-von-frey-hairs-leaflet.pdf).

Subjective assessment

Unlike a temperature, rash or a broken leg, pain can't be seen or tested for, it is a subjective, personal experience. Clinicians, carers and family should be alert to the possible presence of pain and clinicians should have the skills and tools necessary to systematically assess pain, which has been referred to as 'The Fifth Vital Sign™' (http://www.ampainsoc.org/whatsnew/painmonth05/downloads/FactSheet.pdf).

When pain is present, a detailed pain history should be taken including assessment of the multidimensional aspects of pain:

- A sensory dimension (the intensity, site and nature of pain).
- An affective/evaluative dimension (the emotional component of pain and how pain is perceived, e.g. dangerous, exhausting, frustrating, frightening).
- Impact on life, including physical, functional and psychosocial effects.

Sensory dimension: pain intensity

- According to Labus et al (2003) the correlation between intensity and pain behaviour, intensity and disability is weak, therefore, why measure pain?

We must acknowledge patients' pain. Asking them to rate the intensity of their symptoms is a complex but important part of the assessment process.

The Visual Analogue Scale (VAS) and Numerical Rating Scale (NRS)

Patients can indicate the intensity of their pain on a 10 cm line (VAS) or choose a number from 0 to 10 (NRS). The NRS is easy to teach patients, and unlike the VAS, can be administered verbally, even by telephone (Figure 13.1a, b).

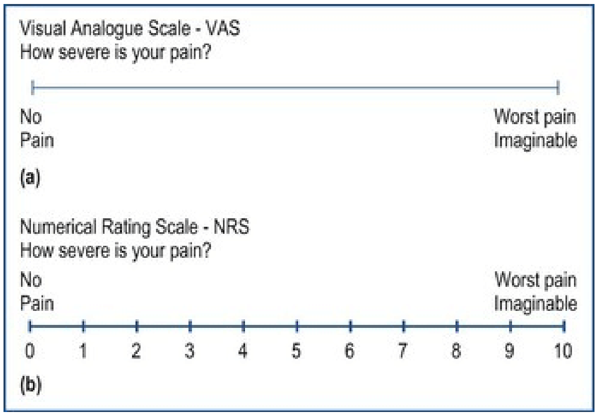

Figure 13.1 (a) Visual analogue scale. (b) Numerical rating scale.

These apparently simple ratings of pain by patients actually incorporate a wide range of factors (Williams et al 2000) but have the advantage of being repeatable and easily systematised.

For young children between 3 and 7 years or those with learning difficulties the FACES pain rating scale can be used (Figure 13.2).

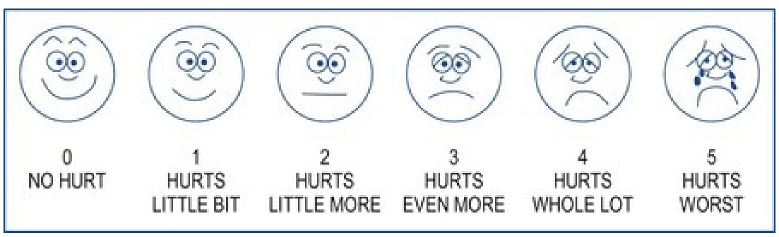

Figure 13.2 FACES pain rating scale.

For some patient groups it can be difficult or impossible to speak about their pain and some psychological states or diseases can seriously affect communication. Time is required to recognise and interpret non-verbal expressions of pain for these more vulnerable members of society. Details of such tools can be found in Powell et al (2010).

Sensory dimension: pain site

For musculoskeletal management, body diagrams are completed more comprehensively and precisely than for medical consultations, ensuring all pain/s and any other sensations of the whole body are included (Figure 13.3). Patients try to judge what we want and may fail to mention information if it is not specifically asked for, e.g. 'I'm here for my back, not my knee', 'My wrist pain is just from using my crutch'.

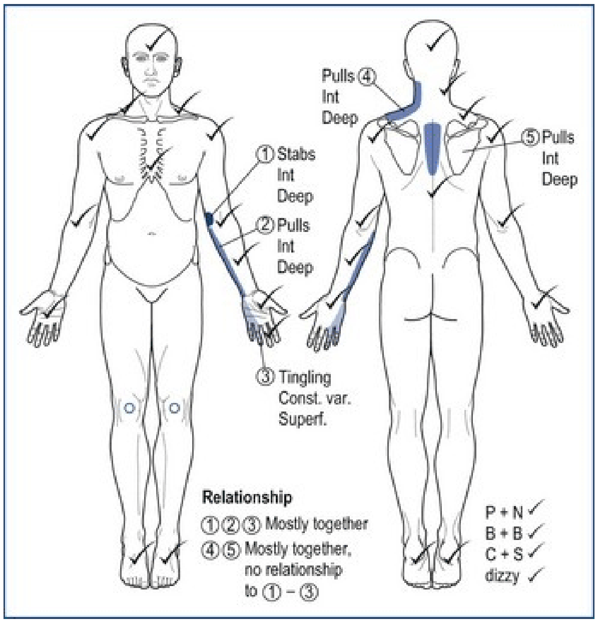

Figure 13.3 Example of a completed body diagram.

Reprinted from Hengeveld E, Banks K 2005 Maitland's peripheral manipulation, published by Butterworth Heinemann, with permission of Elsevier Ltd.

Closed questions produce poor data: 'Do you get headaches?' is less effective than 'Where do you have a headache when you get one?' then 'How often do you get a headache?'

Sensory dimension: pain nature

The nature, quality and changeability of pain should be determined. Do not be surprised about some of the strange descriptions patients give you. What they tell helps to understand their predicament and highlights the remarkable things (lies even!) our brain can tell us.

Patients who feel water trickling down their leg, insects crawling under the skin or whose foot feels huge even when it clearly is not may have wondered if they are going mad. Fascination is a much more useful response from physiotherapists than disbelief. Obtaining details of sensation and perception have made us realise these are altered in a significant proportion of patients and that central sensitisation is behind most of our previous tissue-based diagnoses.

The McGill Pain Questionnaire (Melzack and Torgerson 1971) considers pain quality, but is not as diagnostic as originally hoped nor as useful clinically as asking the patient. It is no longer considered clinically relevant.

Pain history

Basic patient demographic details and medical, pain and injury history need collecting, along

with questions eliminating red flags.

Other subjective factors to document include:

- Usual activity at home, work, social/recreational interests and sport: what has stopped over the last year or so?
- Easing/aggravating factors; avoided activities or postures; sleep.
- Beliefs: why patients believe the pain started, why it is continuing and their understanding of pain mechanisms.
- Impact on patients' lives: losses in the realm of work or education, ADL, social and family life, and emotional distress.

Patients need to 'tell their story' during the assessment giving them opportunity to communicate with us. Many patients will have developed an explanatory model sometimes consisting of quite serious or worrying medical conditions or tissue damage and having a powerful effect on disability and quality of life. The story needs to be elicited and documented.

Allowing patients time to tell it in their way may save time! Key issues and concerns are more likely to emerge and, since patients sense when their information and their perspective is not fully respected, this is an important part of history-taking.

Few patients spontaneously disclose their ideas, concerns, and expectations. Often they suggest or imply their ideas through 'clues'.

Active listening is a skill for recognising and exploring these and will provide an enhanced understanding of patients' situations. Empathy and patience help build the therapeutic alliance.

Eye contact, actively indicating through body language that you have heard and are trying to understand, then summarising, will enable patients to correct any misunderstandings and give you insight into what is being conveyed both factually and emotionally. Nodding or saying phrases like 'I understand' or 'I see' shows acceptance, even if not necessarily agreement with patients' own theories. Unhelpful ones can then be a focus for change.

Neuromusculoskeletal and physical function assessment

Establishing where pain is from and what it is affecting is essential. Physiotherapists can assess the local neuromusculoskeletal systems and the patient holistically. Appropriate clinical reasoning combined with experience will encourage a wider view of patients' problems and enable a clear focus on the key factors.

Objective neuromusculoskeletal assessment

All patients should be assessed with appropriate outer clothes removed; it is possible to miss important signs if this is not done.

Gain consent and view different areas in stages, where possible, to maintain the patient's dignity. Chaperoning (not patients' family or friends) may be required to protect the clinician or at the request of the patient.

Key features for pain patients can include:

- *Skin*: signs of circulatory change, sympathetic nervous system activity, chronic tension and skin binding or freedom, abuse/harm, scars, acute/chronic swelling/oedema, avoidance of touch or pressure.
- *Posture*: reluctance with weight-bearing in standing or sitting; spine changes and right–left symmetry; effect of stiff joints, soft tissue tightness and muscle tension.
- *Range of movement*: general and specific. Hyper/hypoflexibility.
- *Strength*: consider muscle bulk, function and general movement; specific testing to assess neurological integrity; quality of muscle work, including muscle tone and muscle control.
- *Gait*: different surfaces, distances, speeds include stairs, squatting, 1-leg stance, lifting or carrying if appropriate.
- *Palpation*: Some pain states may preclude this, these patients may be able to give sufficient information about tenderness or skin quality themselves, or guide the palpation.

Physical function

Evaluation of the impact of pain on patients' ability to maintain an independent functional lifestyle will indicate the risk of chronicity, the degree of fear avoidance behaviour and influence the physiotherapist's goals (which may be different from patients' goals).

Patient self-report of physical function

Questionnaires can provide a quick assessment of the general degree of functional disability. This is useful for discussing patients with others, e.g. in case conferences, or when auditing outcomes. The choice of questionnaire(s) should take into consideration the department's patient population, why they are needed and what other centres are using, e.g. Roland and Morris Questionnaire for low back pain. Peat (2004) provides good advice on how to determine the merits and disadvantages of questionnaires and their use in clinical, audit or research settings.

Other tools include the Pain Disability Questionnaire, validated for chronic pain (Anagnostis et al 2004), Disabilities of the Arm, Shoulder and Hand (DASH) (Hudak et al 1996) and the Knee injury and Osteoarthritis Outcome Score (KOOS) (Roos et al 1998).

Objective tests of physical function

It is not practical for a physiotherapist to assess all body areas. Effective observation of a specific range of functions will help focus objective assessment. Specific tools or techniques requiring little more equipment than a stop watch will provide objective evidence:

- 5-minute walk, 1-minute stair climbing, 1-minute stand-ups are part of a larger group of physical function measures developed for tertiary pain management programmes, but can also be used in outpatient primary and secondary care programmes (Harding et al 1994).
- Moores and Watson (2004) went on to develop this concept to concurrently and systematically assess physical pain behaviours.
- Clarke and Eccleston (2009) developed the 'Bath Assessment of Walking Inventory' a measure of the quality of walking in the presence of pain, for clinical and research use.
- Simmonds and colleagues developed physical function tests including the 5-minute walk, 50-foot speed walk, 5 repetitions of a sit-to-stand and loaded forward reach for patients with different conditions, e.g. LBP (Novy et al 2002), cancer (Simmonds 2002), HIV (Simmonds et al 2005) and lymphoma (Lee et al 2003).
- The Shuttle Walk Test (SWT) provides a greater challenge for patients than the 5-minute walk test, but requires equipment to provide a regular bleep sound and 2 traffic cones for patients to walk around (Singh et al 1992).

In pain patients these measures of function are more valid, reliable and responsive than traditional ROM and strength measures. They are meaningful outcome measures for patients and their referrers. The use of video means they can also be valuable clinical tools.

Affective/evaluative dimension

Depression

Since injury and pain can have a significant impact on a person's life (e.g. ability to engage in family life, work, social activities) low mood or depression are almost inevitable. Depression due to pain is itself linked to a higher risk of pain chronicity and can become a significant concern. To identify patients at risk, many departments now routinely administer the Depression, Anxiety, and Positive Outlook Scale (DAPOS) (Pincus et al 2008) or Hospital Anxiety and Depression Scale (HAD) (Snaith 2003). The physiotherapist should be familiar with these and when scores identify a problem requiring further evaluation, onward referral or urgent attention.

Departments that regularly see chronic pain patients may screen for depression using the Beck Depression Inventory (BDI) (Beck et al 1988) or short-form BDI (Steer et al 1999). Both are primarily screening tools to assess risk of suicide or self-harm and therefore should only be administered if there is direct access to psychological help if suicidal ideation emerges.

Many chronic pain patients have suicidal thoughts. Consult local guidelines and departmental protocols for working with suicidal patients: learn to recognise the signs and how to discuss these with such patients to ensure they know what to do to keep themselves safe.

Anger and frustration

Assessment may reveal anger and/or frustration that may be focused on:

- The cause of the pain if the person feels powerless to have prevented it:
  - An accident where someone else was at fault.
  - Surgery or other intervention with a less than ideal outcome.
- The inadequacies of the Health System: they have not felt believed or taken seriously.
- Legal and medical assessments undergone for 'the other side', where their integrity has been questioned; where surveillance has been used to 'catch them out'.

Patients may need someone to listen in a non-judgemental way, believe them, explain the likely reasoning for decisions made, and suggest what can be done to help them move forwards.

It is rare, if this approach is taken, for anger to continue to be expressed in a way that feels disconcerting. If a patient continues to make you feel unsafe then this should be reported to a senior team member. A decision will need to be made for onward referral specifically for anger management or alternative strategies.

Pain self-efficacy

Developed out of Bandura's (1977) work on self-efficacy, pain self-efficacy is the confidence to do things despite having pain. All voluntary behaviour change is regulated by self-efficacy. Patients with high self-efficacy are more likely to engage in coping behaviours because success is anticipated and they believe they can do them despite the pain (that is to say 'with it'). Patients with low levels however are less likely to use adaptive or helpful coping behaviours, believing that these may not be effective, or possible, in the presence of pain (Williams and Keefe 1991).

Patients understand self-efficacy as confidence. When a patient says *'I feel safe to walk without my stick here, but I couldn't go to the shops without my husband and my stick'*, and she has a wish to go shopping alone, then it can be identified that it is confidence that needs working on. Phrases like *'If I thought I wouldn't fall I'd do … xyz', 'I don't know if I can manage', 'I don't dare …'* or indications that patients feel fragile, mean confidence is an important factor. Patients generally recognise its important role and the good feeling it brings, and usually wish to work on building it.

It is formally assessed using the Pain Self-Efficacy Questionnaire (PSEQ) (Nicholas 2007) which has been used in numerous studies by physiotherapists. It is reported as

clinically very useful since this psychological construct is highly correlated with objectively measured physical function, is sensitive to change and an important predictor of pain management, physiotherapy outcome and return to work (RTW) (Tonkin 2008).

Fear of movement (kinesiophobia)

Fear of movement, certain functions or situations that have become linked to pain or its onset, have an impact on physical function or work that is different to self-efficacy, although there is significant overlap (Kori et al 1990). The Tampa Scale for Kinesiophobia (TSK) is used quite widely in pain management and physiotherapy departments where graded exposure is being used for avoidance of movement due to fear (Clark et al 1996, Vlaeyen et al 2002). This can be useful to flag up those patients who have generalised fear-avoidance that requires a different approach to the usual exercise and activity pacing.

Catastrophising

- Pain catastrophising, where patients view things in an overly negative way has been found to be consistently predictive of outcome. Patients reporting high levels of pain catastrophising also report higher levels of pain, psychological distress, and physical disability. High levels predict both future levels of pain and resulting disability.
- Catastrophising in these patients is best assessed using the Pain Catastrophising Scale (PCS) (Sullivan et al 1995, Keefe et al 2009).
- Catastrophising is not easy to change, so when significantly present seek assistance from a pain specialist physiotherapist or psychologist as the patient could need psychological intervention.

Assessment of different patient groups

Guidelines are available for assessing pain in various patient groups including babies and the elderly (http://www.britishpainsociety.org/pub_professional.htm). Accident and emergency, intensive care, ward-based, outpatient departments and primary care centres will have their own guidelines for the assessment of pain.

Assessing risk of chronic pain disability

Factors indicating a high risk of pain chronicity and disability can be seen soon after onset. Referred to as 'yellow flags' (Kendall et al 1997), the psychological risk factors for chronic pain disability are distinct from the red flag serious medical risk factors. The 'Acute Low Back Pain Screening Questionnaire' developed by Linton and Halldén (1998) was used to assess

yellow flag risk indicators in LBP patients. The identification of risk factors for LBP chronicity and guidelines for management have been covered in detail by Van Tulder et al (2005), Main et al (2008) and Kendall et al (2009). The 'yellow flag' approach is now widespread; used routinely or when yellow flags are suspected. It ensures patients receive appropriate management from the onset (Watson and Kendall 2000).

This framework was further developed once the importance of workplace factors was established. Identification of relevant obstacles that delay recovery and RTW is now divided into three types (Main et al 2008, Kendall et al 2009):

- Yellow flags (about the person) – mainly psychosocial factors associated with unfavourable clinical outcomes and the transition to persistent pain and disability.
- Blue flags (about the workplace) from perceptions about the relationship between work and health, associated with reduced ability to work and prolonged absence.
- Black flags (about the context in which the person functions) include relevant people, systems and policies. These may operate at a societal level, or in the workplace and may block the helpful actions of healthcare and the workplace. Unchangeable factors need identifying so they can be navigated around. Black flags indicate the potential need to involve relevant others including professionals.

Remember the phrase: 'Person, Workplace, Context'. It emphasises appreciation of an obstacle, so it can be overcome or bypassed.

As with yellow flags, the blue and black flags do not necessarily indicate the presence or severity of persisting pain.

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Chapter 13

E-materials

Author profiles

Vicki Harding PhD MCSP

Vicki Harding is Research and Clinical Specialist Physiotherapist for the cognitive-behavioural pain management programme INPUT, St. Thomas' Hospital London. Following 8 years experience as a manual therapy clinician and tutor, she helped set up this interdisciplinary residential unit in 1988, initially as an RCT comparing inpatient with outpatient programmes. A founder member of the Physiotherapy Pain Association, she has been a past PPA Chair, and was an associate editor of the journal 'Pain' for 4 years. She gained her PhD in developing physical performance outcome measures for chronic pain management, and joint hypermobility assessment.

John Mclennan PG Cert Pain Management GradDipPhys MCSP

John Mclennan has been the Lead Physiotherapist for the Lothian Chronic Pain Service since 2001, after working for the Borders Chronic Pain Service since its inception in 1994. He had joined the Borders Community Physiotherapy service in 1991 and was the Lead for the Borders Back Service.

John chaired the Physiotherapy Pain Association North and is the current Honorary Secretary of the North British Pain Association. He is a member of the Scottish Government's Chronic Pain Steering Group and NHS Education Scotland's Physiotherapy Educational Forum.

Lorraine Moores MSc GradDipPhys MCSP

Lorraine Moores is Principal Physiotherapist and Pain Management Programme Lead working within the interdisciplinary team at Manchester and Salford Pain Centre, Salford Royal NHS Foundation Trust.

Lorraine is a past Chair of the PPA. She has published on the development of a measurement tool for assessing pain behaviour, Return to Work for the chronic unemployed with pain, and long-term follow-up results for pain management. She has contributed several chapters on case studies and clinical application of pain management.

Appendix 13.1 Self-attribution and problem solving

A Physiotherapist solves the problem/tells the patient what to do

Physiotherapist: 'Hi, nice to see you. You look looser and straighter, your head's moving more freely'.

Patient: 'Oh, is it? I feel much sorer than last week'.

Physiotherapist: 'That's because you're moving more. Show me how the exercises are going' (patient does neck rotation, but with tension in the neck and shoulders and some wincing).

Physiotherapist: 'That looks pretty tense, try relaxing, do it slower, keep breathing'.

Patient: (continues as above) 'Yes, I'm trying to relax, but I can't'.

Physiotherapist: 'Try letting your shoulders sink down, breathe in, then as you breathe out, gently turn your neck'.

Patient: 'Like this?'

Physiotherapist: 'Yes good, but you need to let your shoulders relax down more'.

B Patient encouraged to recognise *his* achievements and problem-solve

Physiotherapist: 'Hi, nice to see you. You're looking looser and straighter; your head's moving more freely!'

Patient: 'Oh, is it? I feel much sorer than last week'.

Physiotherapist: 'So, you're moving better, but it's much more painful. Why do you think that might be?'

Patient: 'Well, I don't know, that's why I asked you!'

Physiotherapist: 'What makes it particularly sore?'

Patient: 'I think it's some of the exercises. I know they're helping, I'm freer, so I don't want to stop them, but whenever I do the turning exercise it seems to set off that awful muscle spasm'.

Physiotherapist: 'That's a good link to have made. What do you think could help?'

Patient: 'Well, I'm trying to relax, but it's not easy'.

Physiotherapist: 'Great, and relaxing isn't easy to start with. Show me how they are going' (patient does neck rotation, but with tension in the neck and slightly in the shoulders).

Physiotherapist: 'What are you feeling?'

Patient: 'Well I'm trying to relax my shoulders'.

Physiotherapist: 'Yes, I can see that, that's good. Anything else?'

Patient: 'It's tight round here (touches right C1 area) and actually that's where it's really sore'.

Physiotherapist: 'Yes, it's really hard to relax where it's really sore. Is there anything else you've tried to help relax up there?'

Patient: 'Well maybe I could do a smaller exercise to that spot to loosen it up, like the nodding exercise'.

Physiotherapist: 'Mmmm Good! I think you're on the right track there. Keep going like that, it will come eventually. Are you pleased with how it's going?'

Patient: 'Yes, it's been stiff a long time, so I suppose that's pretty good!'

NB Notice how both physiotherapists acknowledged the pain without reinforcing the pain talk.

Appendix 13.2 SMARTER goal setting

Specific 'What' and 'how much' to do to clarify what is being aimed for.

Meaningful i.e. linked to their values. If someone's values are travelling and fitness then a goal of walking for fifteen minutes is less meaningful than walking to the library to get a book about Africa.

Agreed Having a stated, written and agreed goal helps focus the patient towards goal achievement; approval helps the patient realise he is on the right track.

Realistic Within financial means, appropriate for age, family situation, etc. not necessarily immediately achievable but gradually, as capabilities improve.

Time-planned Establish 'when' short- and long-term goals are expected to be achieved and the time of reviews.

Exciting It is most important that goals include pleasurable and exciting activities that provide reinforcement for patients' efforts, as well as being relevant to the desired quality of life changes.

Re-evaluated Rather than just checking goal achievement, re-evaluation helps problem solving and skill refinement, e.g. 'I managed well, but put myself at risk of doing too much: next time I need to plan more time for breaks and negotiate a back-up to look after the children'.

Appendix 13.3 Unhelpful cognitions or habits of thinking

- All or nothing thinking: 'If I don't get finished in time, I'm a complete failure' (feel hopeless).
- Mental filter (believing that one negative feature of a situation characterises it all): 'The bus conductor annoyed me, it's ruined the whole day' (feel angry).
- Mind-reading (believing yourself to be thought of negatively by others): 'The physiotherapist must be thinking I'm not trying' (feeling anxious).
- Catastrophising (believing things to be worse than they are): 'My shoulder's hurting again, I must have really injured it, I won't be able to manage work for weeks, I may lose my job' (feel worried, desperate).

- Should-statements (believing that your standards expressed as should, ought to, must and have to, are fixed absolutes – also called 'musturbation'!): 'I should be able to manage lifting that weight/I must finish all my typing today/the physiotherapist ought to be helping me more' (feel exasperated, desperate, angry).
- Labelling (believing yourself or others to be defined by one or more acts): 'It's really pathetic I can't lift my leg, I'm a real wimp' (feel annoyed, a failure).

Harding 1998.

Appendix 13.4 Cognitions in a social exercise setting – alternative cognitions & problem solving

The patient has stopped going to the gym. She thinks to go again she:

- Has to be as fit as others in the class or she will hold things up.
- Has to be able to do the whole class.
- Can't start until she has lost weight, and has a new track suit.
- Can't go until she feels her old fun self to join in with the banter and go out after for a coffee with her group of friends **(should statements)**.

She feels she has to be pain-free/to have a lot of time to do all this, and so it becomes 'impossible' **(all or nothing thinking)**.

She would be encouraged to look at what others would expect considering her circumstances and pain, and whether her friends would rather want to see her again or just have someone else in the class who was fit **(more helpful cognitions)**. Alternatives to being fit, slim and 'the life and soul' can be investigated **(problem solving)**:

- Go and talk to the class instructor about what has happened and how she will start with just part of the class or the easier exercises to start with.
- Borrow her sister's Nintendo Wii Fit to get started and build confidence.
- Ring her friends and explain her situation to them.
- Remind herself how another friend tackled returning to the class after a bereavement/an operation: what seemed to work for her.

Appendix 13.5 Helpful cognitive strategies from sport

Just before competing:

NOT focusing on:

- How well the other person may have won last time.
- That he has won 3 out of the last 4 matches.

Focusing on:

- Your achievements during training.
- Times when you have won and focusing on the strategies that helped this.

Appendix 13.6 Misunderstandings or conflicting beliefs

Physiotherapist: 'You have pulled a muscle in your leg so it needs exercise to help it heal up'.

Patient (thinks): But the trapped nerve in my bottom is pinched when I exercise, the pain is really sharp – it's excruciating – I can't possibly do that, I could cause severe damage to the nerve.

Case Study 13.1

Background

30-year-old female passenger involved in a rear-end collision while waiting at traffic lights a week ago.

She reports the headrest adjustment was loose and low, so her head went back over it before whipping forwards. The seat belt stop jerked her neck to the left.

There was little pain immediately, so she refused to go to hospital but saw her GP the next day after waking with a stiff neck and increasing neck and back pain. The GP gave her dihydrocodeine and anti-inflammatories and told her to 'take it easy'.

She now complains of severe pain and tenderness over the whole posterior neck and neck muscles, particularly around and right of C6/C7/T1 and T4–T7. Her old back injury pain has returned with pain across L3/L4. She has had a background headache for days and a constant feeling of a lump in the throat, worse when swallowing.

She finds it extremely hard to get comfortable at night, many times having to sit up because of 'unbearable' thoracic and C/T1 pain which aggravates her headache. She has noticed tingling in all fingers, right hand slightly worse than left.

She wears a scarf wrapped around her neck and reports wearing an old neck collar at night.

On assessment all movements look very painful and limited; undertaken with caution and muscle guarding/spasm.

There are no red flags. Her reflexes are normal, and lateral movement of the hyoid bone, cricoid and thyroid cartilages are normal though painful.

When asked what would happen if she moved further she says the pain would be unbearable – she has experienced moving too quickly too far: 'I don't want to do that again!' She admits to being concerned about further damage: she's sure the original accident tore muscles and damaged joints or the discs 'it hadn't hurt much to start with, so I must have been in shock'. She thinks the tingling in her fingers means she probably has trapped nerves.

She admits to getting down about the pain: the lack of sleep, worries about the effect on her work, wondering how long it will go on for, and whether it will ever get better. This is the first time she has felt down like this.

Treatment

- Reassurance that her neck is healthy, just very sore as she has been in an RTA. Similarly the muscles at the front of her throat would have been yanked on as her head was not fully stopped by the headrest.
- Acknowledgement of her pain: muscle spasm can be extremely sharp and painful, and pain and sensitisation following injury is normal but pretty unpleasant. Her throat likewise is normal; the lump will be the sensitisation as well as perhaps some muscle spasm though this should settle when normal movement is regained.
- Given a brief explanation of post-injury sensitisation in the CNS, and that the neck is immensely strong: touch and normal movements are not damaging even after a whiplash. The pain is not a sign of further damage; pain worse later rather than immediately is hypersensitivity – just as happens with sunburn. The process of healing briefly explained, with the need for gentle then progressive movement to reduce pain, limit stiffness and muscle spasm and encourage strong repair.
- She is now at the subacute stage however so encouraged to start moving as normally as possible, as this would NOT cause more damage and would help speed up tissue recovery. Taught to do gentle relaxing movements to other joints first then to the affected joints: helping the muscles to be more relaxed when beginning painful movement. Now it is not acute she is encouraged to try out both heat and ice: which works best to reduce the pain and spasm? Encouraged to build up her general activity: take the stairs to her 4th floor flat, not the lift.
- Since immobilisation increases pain and encourages muscle spasm on movement, she was praised for getting up in the night and encouraged to use this, together with relaxation and regular changes in position as a strategy until the pain eases further. Her sleep is interrupted so she was reassured relaxation and rest are almost as good and she would soon find she could sleep for longer.

Reviewed in 1 week

- ‘I don’t know what you did last session, but I felt like a massive weight was lifted and I felt happy again. Even though the pain is there, it doesn’t worry me’.
- All neck movements nearly full, just slightly stiff. The lump in her throat has diminished: shoulder range of movement has doubled with much less tension/caution.
- Normal treatment commenced: yellow flags are no longer an issue. Mobilisations help movement further but are always linked to relaxed movements she can do herself that relate to function. She is taught to raise her shoulders into full elevation in lying to encourage relaxed movement with thoracic extension, and to lift light weights above the head (short lever) while standing. Lumbar flexion loosens after hip lateral rotation stretches followed by knees to chest in lying, then finally bending forwards in standing, knees straight (additional dural stretch; challenging old beliefs that bending at the back rather than at the knees is dangerous) and neck as relaxed as possible ‘let your hair flop towards the floor’.
- Instant acknowledgement and reinforcement of each slight relaxation of muscles and movement in the direction required; mainly subtly but with a summarising positive verbal acknowledgement.
- Plans for graded return to work and her usual dance class.
  - How to set baselines when starting activities again
  - Discussion on pacing-up activities (move forwards from avoidance without boom then bust)
  - General exercise programme related to dance.

Conclusion

- Yellow flags are relevant in acute pain/injuries.
- Need appropriate screening and early intervention.
- Thorough assessment and self-management focus with simple treatment helps prevent chronic pain and disability.

Case Study 13.2 Behavioural experiment

Background

35-year-old woman with multiple unsuccessful surgeries for anterior knee pain. She is fearful of walking without the right knee brace provided by her surgeon. She reports many episodes of falling when walking and on the stairs, with lots of bruises and a broken wrist from falls. She has removed the brace to do floor or sitting exercises, but always puts it on for standing and walking.

Her right quads are moderately wasted; knee flexion 80°.

Therapist: ‘Accepting that it will be painful and you’ll feel very insecure, what do you

predict will happen if you walk 5 metres down this corridor without your brace?'

Patient: 'My knee will give way and I'll fall'. Her words are written down.

Therapist: 'What are your chances of falling?'

Patient: '100%'. Written down.

She agrees to do an experiment to test the prediction: to walk 5 metres without her knee brace then sit down.

While walking her knee is held straight, her gait unsteady and weaving. She sits down with difficulty, placing her hands on the chair seat as soon as she is within reach, turning to sit by hopping.

Patient: 'It didn't happen that time, but I know it would if I tried again'.

Therapist: 'How many times do you predict you would need to walk up that corridor without your brace on to guarantee to fall?'

Patient: 'Three'. Written down.

Therapist: 'Shall we test that prediction out? What are your chances of falling this time?'

Patient: '80%'. Written down.

The experiment is repeated and predictions recorded. After 4 experiments she walks with a smoother gait and sits down more normally. Her predictions of how likely she would fall have dropped to 30%. This is not remarked on. Instead she is asked for her views on her initial prediction of 100%, its accuracy and whether it had affected her confidence to try walking without her brace.

She acknowledges that her initial prediction turned out not to be accurate and that while she still feels anxious about walking without her brace, her anxiety is now less. She can see the 100% prediction had influenced her confidence before she started.

Therapist 'It seems walking in a straight line without your brace on doesn't cause you to fall, but what would be more of a challenge, cause your knee to give way and for you to fall?'

Patient 'Changing direction; turning round'.

Therapist: 'Okay, so if you were to stand here then walk to the right in a complete circle, what would happen?'

Patient: 'My knee would give way and I would fall; it doesn't like going to the right'.

Therapist: 'What do you predict are the chances of that happening?'

Patient: '80%'. Written down.

After one hesitant but successful walk around to the right:

Therapist: 'So how many times do you predict you would need to do it to guarantee that you would fall?' – and so on.

After six experiments the predictions are down to 30%. Although she limps sometimes when the weight goes onto the right leg and shows some anxiety, she has not fallen.

Therapist: 'What would you worry about doing at home without the brace?'

Patient: 'The stairs!'

Therapist: 'What do you predict would happen if you went up the stairs without your brace on?'

Patient: 'My knee would give way, I would slip and fall; I've fallen on them before.' Written down.

Written down.

Therapist: 'How about testing that prediction out just like we did today? You can ring me in 2 days to tell me how it went. Here is the prediction and conclusion sheet to fill out.'

In view of the limited knee flexion and fear of falling it can be predicted that stair climbing will initially involve hip hitching, general muscle tension and behaviours associated with pain and fear. The patient, however, knows how to perform a behavioural experiment and in doing so and repeating the task much of this behaviour reduces, particularly since at each review you focus on her achievements. She now has ownership of improvement and receives the credit for it. With a little guidance through Socratic questioning, the final few details to regain normal stair climbing, and with it improved knee flexion, can be achieved.

Considering her surgery, how much knee flexion, can be regained is difficult to predict. Give her some time to work on her function by challenging any residual fears (help her to keep moving the goal posts) and surprise you!

Case Study 13.3 Pain management

28 year old roofer. Lives alone, ground floor flat

Injury at work 4 years ago: fell backwards down narrow staircase. Remembers "bouncing off the walls". Undisplaced #C4+5, L3+4.

For 4 years not worked, climbed stairs, crouched, bent, knelt, got on the floor or into a bath. Always uses elbow crutches

- To reduce pain on WB left leg.
- "Takes pressure off my back".

Values

- Work: reflected how much of himself he has lost through not working.
- Social life.
- Being fit.

Goals

- Go back to work: "roofing may be too much" but wants to go to college or find other work.
- Get off crutches; go down the pub with his mates without them.
- No fitness goals at present; seems impossible, but loved golf and football.

Objective – salient points

Walking: 2 elbow crutches, 10° fixed flexion left knee to max 30°, NWB left heel.

Stairs: anxious, especially going up, managed 4 steps pre-treatment assessment (right leg up, left leg down).

Treatment

Pre-programme practice: 4 stairs (neighbour's) 2-3 × daily.

1.1 *4-week pain management programme*: General circuits and stretches, including stairs (4 stairs using both legs + handrail/wall), getting onto the floor, 'kneeling' PWB left knee, but not exercise bike: insufficient left knee flexion. Using 2 crutches.

1.2 **Review after 1 week.**

Increased pain experience

- "Only just managing" with current pain levels; "doesn't want any more".
- Now WB through left heel "due to stretch and my plan to put the heel down every 3rd step". Increased calf pain but it always settles: "okay training pain; necessary for getting the heel down".
- Knee pain though "not okay: burning, can't think of it in the same way". Not sure why and frustrating him. He really wants to work on this now, has progressed to bending 60°, but guarded.

Cost/benefit analysis for bending his knee

- "So I don't have to limp around with my crutches and can look normal – especially at the pub."
- "So I can go back to work."

Cost/benefit analysis for walking up & down stairs

- "So I can go back to work: give me more options."
- "I don't go out as I can't go upstairs to use the toilet. I once had to use a bucket in the garden. Awful."

How he manages increased calf pain with heel WB.

Breathing and relaxing.

1.3 Thoughts when he has increased knee pain

"I know pain doesn't mean damage, but I can't make myself go through it."

1.4 Has he ever tried staying with it? What happened?

Anxious, sweating, heart pounding; usually stops at this point. Reflecting on this, reported he'd never tested out what would happen if he stayed.

Key considerations

- Not just about feelings of anxiety, but also increased pain.
- Never tested whether anxiety or pain would continue increasing exponentially.

1.5 Week 2 Graded exposure

Preparatory fact finding discussion; principles explained

- Current pacing level for kneeling: 7 seconds. Not sufficient to provoke anxiety symptoms.
- Predictions about kneeling for longer
  - Predicted pain would increase immediately.
  - Didn't know how long he'd kneel for before feeling anxiety sensations.
  - Anxiety would definitely increase too, but confident both would return to usual levels if not done "too long".
- Reminded about opting-out any time.

Exposure

Explored 4-point kneeling, left knee 80° (predicted anxiety 40/100). Stayed 32 seconds, stopping because he couldn't tolerate the pain.

Wanted to try again as anxiety only 25/100. Did 4-point kneeling for 73 seconds. Went through waves of anxiety with tense hands but did breathing control: "It didn't increase!" Pain followed a similar pattern. Stuck with it for 3 more cycles: pain ISQ, settling quickly; anxious feelings to 10/100. De-briefed, but then got straight onto exercise bike, did 0.8km and said "I love it!" That weekend his mother gave him her's. Within 1 week peddling at aerobic level for 13 minutes. Maintaining kneeling with anxiety rating practice.

Other fears: going up stairs

Feels he "conquered that fear" day 1, but still anxious about narrow stairs: his original injury

setting. Thought the work on kneeling anxiety gave him the confidence to do the bike, but wouldn't help his fear of narrow stairs (still avoiding his mother's). Wanted to do them to reduce anxieties.

Graded exposure to stairs

Psychologist checked for flashbacks associated with stairs: essentially none. Fear hierarchy reviewed (Table 1).

Table 1 Hierarchy of fears

Wk 1	Wk 2	Wk 4	
100++	80	25	Walking up & down a flight of narrow stairs nobody around.
100	40	10	Walking up & down a flight of narrow stairs someone present.
90	30	10	Crawling on all 4s.
80	10	0	Kneeling FWB left knee.
70	0	0	Riding exercise bike.
60	10	5	Walking up & down 6 steps using both legs, no-one present.
50	40	15	Twisting the back while swinging a golf club.
40	5	0	Walking up & down 6 steps using alternate legs, someone present.
30	20	0	Walking 5 yards no crutches, PWB left heel.
30	0	0	Kneeling 10% PWB left knee, 30 seconds.
20	0	0	Walking 5 yards with crutches PWB left heel.
10	0	0	Walking up & down 4 steps no-one present.
5	0	0	Walking up & down 4 steps someone present.

Rating of anxiety with feared activities assessed end of week 1, week 2 (post-exposure work for kneeling, pre-exposure work with stairs) and end of week 4.

Physical outcome measures

	Pre-treatment	Last day	1-month follow-up	9-months follow-up
5-minute walk (m)	5	275	363	467
1-minute stand ups	3	13	22	34
1-minute stairs	4	76	100	139 (ran)

He decided on 4 stairs from 1st floor (physio present) down to the next landing, climb back up, then go down further and up. Relaxed and calm; predicted anxiety during 30/100.

After down and up 4 stairs, reported sweating but "that was okay"; anxiety 25/100. Repeated: 15/100; again: 10/100.

Requested doing it with the physio out of sight. Did it, "no problems"; anxiety 15/100.

Next tackled whole flight, (physio present). Anxious feelings prediction now 30/100; after 15/100.

Repeated with no physio present: anxiety prediction 20/100; after 15/100; after 2 more repetitions 10/100.

Couldn't think of stairs he'd avoid now. Said he avoided his mother's stairs before to avoid failing in front of the family; didn't feel he could go alone first time. Will try now.

Reflected afterwards "Nothing should stop me doing something. Every time I do things it's less and less of a problem; I realise I can manage."

Discharge achievements

- Not using crutches; walking pacing level 4 minutes, repeatable 5 times with breaks. Keeping one crutch at home for long distance walks. Went to 6 pubs and 1 club last night without crutches!
- In and out of the bath.
- Off all medication.
- Climbing 2 flights of stairs – no rails, normal pattern.
- Bending, crouching, crawling in preparation for work as estimator for fitting flooring, 3 hours twice a week.
- Tried golf club half swing; plans to do pitch & putt with 3 friends before follow-up.
- 1 minute dribbling a football; plans teaching neighbour's son football skills twice a week from next week.
- Thinking of doing college courses now not hampered by crutches.

1/12 follow-up

- Working 3 hours twice a week. Able to pace, move around etc.
- Thinks his big achievement is climbing stairs. On considering it, a little anxiety about narrow stairs, but just climbs them.
- Cycling 10k alternate days; already worn out one exercise bike!
- No crutch use.
- Teaching neighbour's son football skills weekly.
- Played golf doing half swings but increased pain: "golf involves so much twisting". Not done since but thought he may do more of the twisting stretches to build up.
- Future goal: play football. "There's no better way to get back than actually kick a ball around".

Asked why he thinks the best way to return to football is to do it, yet he's been put off

golf? Smiled; recognized the incongruity. “I know what to do. Definitely!”

Chapter 13 Pain management multiple choice questions

1. Who termed pain a ‘need state’?
    a). Ronald Melzack
    b). Patrick Wall
    c). David Butler
    d). Lorimer Moseley
2. Which of the following is not recognised as a factor that will alter pain perception?
    a). Beliefs
    b). Culture
    c). Gender
    d). Environment
3. What is the timeframe for defining chronic pain as proposed by Gordon Waddell in ‘The back pain revolution’ (2004)?
    a). 12 weeks
    b). 16 weeks
    c). 6 weeks
    d). 10 weeks
4. What is a commonly recognised timeframe for defining chronic pain used in practice?
    a). 6 weeks
    b). 6 months
    c). 12 weeks
    d). 8 weeks
5. Allodynia is defined by which of the following?
    a). A nociceptive state as a result of repeated injury
    b). Damage to the nerve itself producing neural symptoms
    c). A nociceptive sensitivity to nicotine that presents in heavy smokers
    d). A state of hypersensitivity
6. Which of the following is classified as a cause of neurogenic pain?
    a). Osteoarthritis
    b). Work-related upper limb disorder
    c). Low back pain
    d). All of the above
7. Which of the following is a recognised method of measuring pain?
    a). Shuttle walking test
    b). McGill pain questionnaire
    c). Numerical rating scale
    d). HADS
8. Which of the following is not recognised as a measure of depression?
    a). DAPOS
    b). HADS

    c). BDI
    d). TURP
9. Catastrophising is where a patient...?
    a). 'Shops around' clinicians searching for a cure
    b). Has a negative outlook
    c). Believes they have a life-threatening illness
    d). Always seems to get injured if they participate in a physical activity
10. Which of the following statements is incorrect?
    a). Those who regularly take analgesia or other psychoactive drugs like alcohol may require higher doses
    b). Care is taken that patients do not take doses that put kidney or liver function at risk
    c). Do not use NSAIDs or larger doses of opiates with the over 70s
    d). Pain relief is enhanced in those who regularly take analgesia or other psychoactive drugs
11. Which of the following may help a patient to deal with their pain?
    a). A diagnosis, e.g. slipped disc
    b). Informing them that it may never resolve
    c). Information about the inflammatory process and usual duration
    d). Knowing the difference between NSAIDs and opiate medication
12. Which of the following is least likely to lead a patient into a chronic pain state?
    a). Avoidance of activity when the pain occurs
    b). Forcing activity, whilst ignoring pain, no matter how strong
    c). Being told by their therapist that the pain 'is not that bad'
    d). Management of avoidance behaviour at the earliest opportunity
13. Physiotherapists can influence depressive behaviour by which of the following?
    a). Advising the patient to take more pain medication
    b). Ensuring the patient feels believed
    c). Advising the patient to go to their GP
    d). Telling them that they will get better one day
14. Improvements are seen in patients with chronic low back pain if...
    a). Pain is discussed and analysed
    b). Pain is ignored
    c). Praise is given rather than criticism
    d). Pain is logged in a diary
15. Which of the following would not be classed as a value domain?
    a). Family relationships
    b). Health/physical well-being
    c). Education/learning
    d). Pain perception
16. Pacing is...
    a). The steady build-up of an activity

b). Guided by the onset of pain in relation to activities
c). The process of avoiding rest to build up activity
d). A process that requires a therapist to set the goals

17. Which of the following would not be classed as an unhelpful cognition?
    a). Focusing on one negative feature in a situation
    b). Believing that others think negatively about you
    c). Believing things are worse than they are
    d). Not worrying what others think about you
18. Which of the following are components of the graded exposure approach to pain management?
    a). The importance of facing feared situations
    b). Understanding that avoidance is the main contributing factor
    c). Prepare patients for the tendency for fear/anxiety feelings to return
    d). All of the above
19. Which factor is least likely to present in an individual with chronic pain?
    a). Reduced level of housework or DIY activity
    b). No longer finding it easy to do things
    c). Decreased pleasurable and social activity
    d). Being driven to achieve a task
20. When approaching the management of a patient with pain as the main problem which of the following is not a helpful strategy?
    a). Using active listening skills
    b). Using operant principles when getting patients to practise motor skills
    c). Focusing on achievement
    d). Ensuring the patient knows they are being treated by an expert

Pain management multiple choice answers

1. b)
2. c)
3. c)
4. c)
5. d)
6. d)
7. c)
8. d)
9. a), b)
10. d)
11. c)
12. d)
13. b)
14. c)
15. d)

16. a)
17. d)
18. d)
19. d)
20. d)

Chapter 14

Rehabilitation

Introduction

Rehabilitation is a combination of the processes of treatment and education that help disabled individuals to attain maximum function, a sense of well-being, and a personally satisfying level of independence.
Rehabilitation may be necessitated by any disease or injury that causes mental or physical impairment serious enough to result in functional limitation or Disability (Venes 2001).

The fundamental principles that underpin rehabilitation in any health setting include:

- Assessment and evaluation
- Patient-centred care
- Goal setting
- Multidisciplinary team work.

International Classification of Functioning, Disability and Health (ICF)

ICF is a useful framework for rehabilitation assessment that helps ensure that these principles are followed (WHO 2001).

The ICF represents a classification system of functioning, disability and health that can be used in any setting for any person. It provides a framework for rehabilitation assessments and management plans.

Part 1

Body functions

The physiological functions of the body systems (including psychological, emotional, cognitive and physical functions).

Body structures

Anatomical parts of the body such as organs, limbs and their components.

Impairments

Problems in body function and structures, such as significant deviation or loss.

Activity

The execution of a task or action by an individual.

Participation

Involvement in a life situation.

Activity limitations

Difficulties an individual may have executing activities.

Participation restrictions

Problems an individual may experience in life situations.

Part 2

Environmental factors

The physical, social and attitudinal environment in which people live and conduct their lives. These are either barriers to or facilitators of the person's functioning.

Personal factors

Age, sex, previous life experiences, personal choices and situations.

Impairments

The older patient may have a number of impairments including weakness, pain, restrictions in range of movement, shortness of breath, pressure sores, incontinence, loss of proprioception, loss of memory, dysphasia and visual impairment.

Consider not only the physical impairments, but also the cognitive psychological and emotional functioning of the body. In clinical practice the individuals in a team of different professionals might take more interest in certain body structures and functions, e.g. physiotherapists will be most interested in the physical deviations, the occupational therapists in the cognitive functions and the psychologists in the emotional and psychological functions.

Activity limitations and participation

Each profession should be aware of the impact of any impairment on the patient's ability to participate in activity. For example if the individual has weak muscles and is very anxious they might not be able to walk, therefore the activity limitation would be difficulty walking. The clinician should be aware of both the anxiety and the weakness as they may be impacting in equal measure on the activity limitation and participation restriction. Understanding the extent to which each type of impairment is impacting on the individual will allow the therapist to target their treatment plan for best effect. In the example if the anxiety has a greater impact than the weakness, the treatment should include confidence building and reassurance, in addition to strength training.

Environmental and personal factors

The environmental factors make up the physical, social and attitudinal environment in which people live and conduct their lives.

The personal factors include peoples' attitudes, values and beliefs about their health, past and present experiences and how they perceive themselves. These are either barriers to or facilitators of the person's ability to function with a health condition. Being able to assess all these areas of the individual's presentation enables the practitioner to identify where his/her skills could help, where others might help and how to develop a customised care plan for the individual.

ICF is now used in health in various settings. It is recommended that rehabilitation therapists familiarise themselves with the ICF framework to help understand the individual's presentation from a holistic perspective (Sykes 2008).

Fundamentals of the rehabilitation approach

Assessment and evaluation

Assessment of the older person must include all the components of the ICF framework to allow the practitioner to consider the long-term impact of the acute presentation and be able to plan for their journey from an acute setting to their preferred destination which may be home or another community-based setting.

Following assessment the practitioner must consider how they will evaluate what they are doing.

Selecting an appropriate outcome measure will depend on what you are aiming to influence with your treatment programme. This may seem obvious, but often people choose an outcome measure that will not be sensitive to change and is not measuring what they want

it to measure. For example global measures of functional change such as the functional independence measure (Stineman et al 1996) or the Rivermead motor assessment scale (Collen et al 1991, Lincoln and Leadbitter 1979, Sackley and Lincoln 1990) may not pick up changes in specific ranges of movement, whereas if you are working on outdoor mobility then the Community Mobility Index would be appropriate. Choose the right outcome measure to evaluate each individual's specific programme.

A helpful tip when looking at the outcome measures is to ask yourself which component of the ICF classification system is the measure focusing on, e.g. a visual analogue scale (VAS) (McCormack et al (1988)) could focus on any of the components, a pain VAS would be targeting the impairment, whereas a VAS on how easy it is to walk to the shops would be targeting the activity and participation component. Evaluation of interventions should not only consider objective measurement.

Today's practitioners should consider how to evaluate the patient experience and the use of patient-related outcome measures should be encouraged. Consider both the quantitative and qualitative evaluation of rehabilitation.

Patient-centred care

It has been identified that practitioners sometimes fail to identify the patients' problems in a way that is meaningful to the patient. It is important that the clinician listens carefully to what the patient has to say during the assessment. It may take more than one session to collect all the information required. If the individual has difficulty communicating it may be necessary to collect information from other sources such as; carers, the patient's GP, relatives and friends, social services, previous medical records, reports from other disciplines are all sources of information which help build a picture of the individual. Failure to assess the environmental and personal aspects of the individual will make it difficult to identify what is important to the individual. Often the focus of the assessment is limited to the impairments of the body structure and function and how this impacts on the activity limitations. How these limitations impact on the individual's participation is vital. For example, if we take an older person who has been admitted from a nursing home with a chest infection and has previously been receiving full care and an older person who has been living with their family and enjoying full independent living. Both patients have the same impairment of admission with a chest infection, but the impact on their activities and participation is very different. Literature suggests that practitioners impose their views and opinions on the individual and do not work in partnership with their patients, to formulate a treatment plan that is patient-centred (Farin 2009). Recent publications suggest that there is a mismatch of views and poor listening skills amongst clinicians (Bloom et al 2006). Good patient-centred care relies on good communication skills, in particular listening (Reynolds 2004).

Goal setting

Set goals from the patient's viewpoint. Goals need to be; specific, measurable, achievable, realistic and timed (SMART) (Bovend'Eerdt et al 2009). Goal setting can be a powerful motivator for patients, equally if the goal is too difficult it can have the opposite effect. Success is important to motivate patients.

Goal setting requires imagination and sensitivity, if the goal appears to be too difficult it is important to work with the individual to reset the targets to enable the goal to be achieved later. An example of setting appropriate goals may involve a patient that wishes to go home from hospital, what they need to do to achieve this is identified. This may involve the patient being able to roll to sit on the edge of the bed. This initial goal is then built upon by further goals working towards the ultimate goal of going home. The process is termed short- or long-term goal setting. The goals may be started in hospital, progressed into a rehabilitation setting either as an inpatient, outpatient, or indeed in the patient's own home. It is important to remember that anywhere along the pathway the practitioner needs to be able to help the person identify where they are going and how they will get there by re-evaluating the goals.

Goals can be anything your patient wants them to be, it is the therapist working with the patient that ensures that they are SMART.

Therapists sometimes find it difficult to set goals, due to the patient not being able to communicate their wishes, as a result of their impairments. In these cases the aim of the rehabilitation may be to manage the patient to get the optimal comfort, care and education goals can be set rather than functional goals.

The concept of active goals and passive goals has been used in the management of spasticity, these may be helpful in other areas (Richardson 1998). An active goal suggests that the patient will be performing some part of that goal themselves, e.g. to open and close the hand around a cup. An example of a passive goal is where the patient's carer opens the hand to cut and clean the nails. Both are achievable and patient-centred, but one involves active involvement and the other involves a carer achieving a care task. Active and passive goals can be patient-centred and SMART.

Team work

It is important to remember that there is no 'I' in 'team', and that the patient is also part of the team. The ICF classification of function can assist a single assessor to identify other team members that might be of assistance. Team work requires good clear communication between the members and an understanding of each other's roles. Being able to identify where other team members' skills and knowledge could benefit an individual is a key part of the rehabilitation process (Nijius et al 2007, Shaw et al 2008). There are many specialist health services available for the care of patients that work together to effectively manage their problems. Consider a list of impairments for one individual and then think about the impact of these on activities and participation. Identify any contextual issues in the environment and the personal factors and then decide who would be the most effective team member to assist in meeting the needs of that individual. If we consider a frail older person who has fallen and is frightened of falling again, who also has a poor memory and does not go out very much, the

impairments list might include, altered balance mechanisms, weakness in the legs, poor short-term memory, fear of falling, low mood. The activity limitations might be, unable to remember her tablets, frightened to go outside, social isolation. The team members that might be able to help could include the physiotherapist, the GP, the pharmacist, the voluntary visiting service, friends and family or neighbours.

Assessment of the complex trauma patient

When confronted with a patient who has multiple injuries, the assessment, management and treatment can be quite daunting. But, by using a step-by-step approach and sound clinical reasoning, success is well within the reach of the student or junior clinician.

Patients who have been involved in serious trauma tend to have multiple problems. These include the physical, psychological and emotional as well as practical and vocational issues to be faced in the future. Because of this it is essential to take a holistic approach to patient care using all the resources of the multidisciplinary team (MDT).

On first contact it is useful to work through a general list of what you 'must do' in your assessment, as in any other. From this basic assessment, together with the patient you can formulate a management plan (Table 14.1).

Table 14.1 Initial assessment checklist

Physical	Musculoskeletal assessment (ROM, Power) Neurology (myotomes/dermatomes) Comorbidities and their management (bladder & bowel) Pain (controlled?) Past and possible future surgery (weight-bearing status) Sexual function (plus its affect on psychological/emotional elements) Aids to mobility (crutches/wheelchair)
Psychological	Personality/mood (present & prior to trauma) Patients understanding of the situation's gravity Mild traumatic brain injury
Emotional	Family support Relationship status (partner, children) Lifestyle (present & prior to trauma) Age/stage of life/career

Function	Premorbid function Present function Predicted function Short- and long-term goals

Complex trauma can be exactly that, complex. Patients have a multitude of problems, all in some way impacting on each other and affecting your ultimate measure, function. It is essential to deal with the patient in a holistic manner with full input and good communication with the MDT.

There are many different presentations of conditions following trauma. Rarely do patients fit into one single category (orthopaedic fracture) without crossover from another (burns and plastic surgery). However, there are certain things that should be considered when dealing with specific presentations.

The amputee

Traumatic amputations can be simple (unilateral below knee) or complex (triple amputee) (Figure 14.1), but both have similar needs.

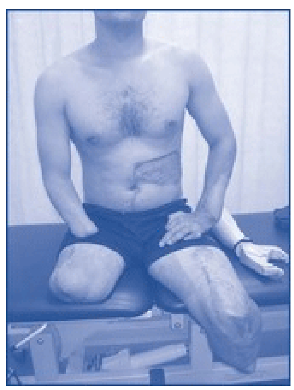

Figure 14.1 Triple amputee, with extensive soft tissue injury.

Assess the integrity (tissue) and functional ability (size, shape) of the stump. Close work with the prosthetic team is essential if mobilising on prosthetic limbs is a goal. They can advise on fitting/gait and prosthetic choice. The availability and development of prosthetic limb technology has progressed to such an extent that bilateral above-knee amputees can independently fully mobilise with no walking aids if rehabilitated correctly.

Rehabilitation should be underpinned by a good understanding of amputee biomechanics and gait analysis. The demographic of trauma patients is such that young previously fit men make up a large portion of the caseload and these individuals have and can achieve challenging goals and recover from a poorly conditioned status after endurance training (Chin et al 2002). Mountain climbing, paralympic competition and waterskiing can

be realistic goals.

Multiple fractures

With high-velocity road traffic accidents or indeed blast injuries from explosions there are often multiple injuries. It is not unusual to see a patient with pelvic, lower limb and spinal fractures. On presentation to you they will often have external fixation following surgery, with a number of further surgical interventions planned.

With these patients normal principles of assessment and treatment apply. A sound understanding of post op protocols (weight-bearing) and future plans is essential. Familiarise yourself with the surgical procedures and their objectives. There are often associated complications such as soft tissue trauma, malunion, compartment syndrome and infection (Figure 14.2). You should be looking to maintain and if possible improve available function as well as liaising with other members of the MDT regarding any complicating factors.

Figure 14.2 Soft tissue injuries and associated bony disruption.

Nerve and soft tissue damage

Patients with isolated soft tissue or nerve injuries are the exception rather than the rule. The velocity during trauma caused by a gunshot wound for example, is such that the two come hand in hand.

A thorough knowledge and understanding of neural anatomy will help to ascertain what is causing weakness during function, deconditioning or structural damage to the nervous system. Patients may be hyper/hyposensitive in particular areas. It is essential to appreciate that nerve damage can lead to poor function of more than just the musculoskeletal system, e.g. bladder and bowel. Peripheral nerve injuries are common, but despite the fast advances in research and technology, a complete recovery following peripheral nerve injury is rare, however considerable progress has been achieved with the development of microsurgery techniques (Tuncali et al 2004).

Particular attention needs to be paid to the management of scar tissue to prevent contractures limiting movement. Patients often have associated burn and graft sites, which need attention (Figure 14.3). The patient needs to be convinced of the benefits of early management of soft tissue injuries in order to treat him- or herself and maximise long-term function.

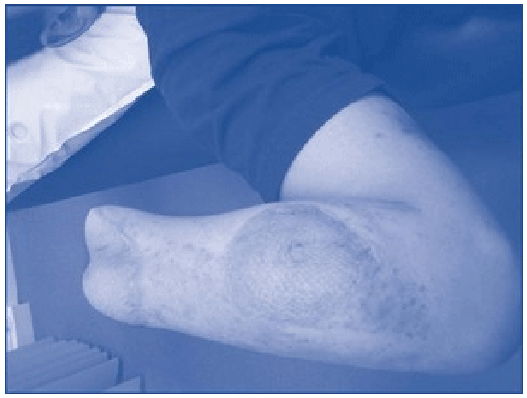

Figure 14.3 Burn and graft site, upper limb.

Psychological trauma

The psychological impact on patients involved in trauma must be considered at all times. The patient's life, and often the relationship between family and friends is changed forever. Some may initially appear euphoric and 'happy to be alive' only to psychologically 'crash' when the reality of future disability sinks in. Others will present with low mood, which can be lightened as progress is made.

Not all people who experience a potentially traumatic event will actually become psychologically traumatised (American Psychiatric Association 1994). Many people experience traumatic events during their life and it is normal to have strong feelings of anxiety, sadness, or stress. Some patients may even experience symptoms of what is known as post-traumatic stress disorder (PTSD) which may include nightmares, memories about the event, or difficulties sleeping (Storr et al 2007). Patients may be experiencing symptoms of PTSD, but only a mental health professional can confirm the diagnosis. Many of the symptoms of PTSD are part of the body's normal response to stress. An individual may experience an event as traumatic whereas another present at the same event may not feel any traumatic effect. Gaining an understanding of the patient's personality and nature pre and post trauma will help to monitor changes in mood and attitude during rehabilitation.

Communication within the MDT and referral to mental health professionals if required should form part of the treatment plan.

Subjective information

Obtaining a detailed subjective history is essential for the formulation of an effective management plan. The patient is often the best source of information, but may not have any memories of the incident beyond the point of injury, e.g. following an explosion. In this case family members, the patients work mates/fellow soldiers or passengers in a vehicle may be helpful.

There will be medical notes from admission to hospital and surgical interventions and contributions from all members of the MDT. Reviewing these is important; as knowing about the success or failure of past interventions will aid future planning. If you are not the first physiotherapist to see the patient it is essential to receive a written or verbal handover for information.

In addition to the demographic subjective history further details are required to formulate a management plan (Table 14.2).

Table 14.2 Trauma-specific questions

Subjective information	**Relevance**
What was the trauma?	Others may have been involved and possibly hurt
Where did it happen?	
Who was involved?	
How does the patient feel about the incident?	Negative effect of psychological factors (PTSD)
Do they have emotional/financial /physical support?	Adequate support systems are essential to aid recovery
To what level do they expect to recover?	Realistic and attainable goals are essential
What career are they involved in?	May not be possible to return to that line of work
What interventions are already planned?	Further surgery will need to be accommodated
Is a family member/partner able to speak with you?	They may often provide a different perspective/view on patient's history
Do they have any dependants?	Partner or children may rely on them for financial support – can increase stress

Objective information

Keeping an objective record of treatments provided helps monitor progress and success. Power, range of motion and functional objective testing is a way to demonstrate meaningful progression and give both the therapist and patient confidence (Table 14.3).

Table 14.3 Outcome measures

Testing tools	**Reasoning**	**Testing tips**

Amputee mobility predictor questionnaire (Gailey et al 2002)	Used early on during Ax to determine current (and potential) function, assists planning appropriate treatment and setting goals	A functional exercise programme can accompany the questionnaire providing guidance on treatment options
T – Test (Semenick 1990)	Simple and reproducible test of proprioception & balance/agility	The type of surface should be consistent to ensure reliability. A test for use with high-functioning patients
Multistage walk test/6Min walk test (ATS guidelines 2002)	The change in the distance walked in the 6MWT can be used to evaluate the efficacy of an exercise programme or to trace the natural history of change in exercise capacity over time	The MSFT can be employed for patients whose functional ability has progressed beyond the 6MWT Standardisation of the six-minute walk test (6MWT) is very important
FIT HaNSA (MacDermid et al 2007)	Provides a brief measure of functional performance of the upper limb	Provides valid assessment of impaired functional performance in patients with shoulder pathology

Treatment planning

Using the information from the subjective and objective assessment a reasoned treatment plan can be made. Despite the complex nature of some trauma every effort should be made to keep the plan simple. If a muscle group is weak and needs to be stronger, strengthen it.

A step-by-step approach thinking of what you must/should/could do will enable the plan to take shape. Use achievable and measurable short- and long-term goals discussed with the patient to confirm progress and give positive feedback. Always remember physiotherapy for complex trauma need not be complex.

Assessment of the musculoskeletal (sports) patient

The assessment of a patient following a musculoskeletal sports injury is carried out prior to rehabilitation and regularly during the rehabilitation process to ensure the patient is progressing appropriately. Without regular assessment the patient may receive daily treatment without meeting their goals within an appropriate timeframe. The process of assessment in musculoskeletal rehabilitation must be well organised with both subjective and objective assessment measures being used.

It is a common approach for some standardised tests to be carried, in order to collect some baseline data prior to rehabilitation starting. This often occurs when a patient has been

series of roadblocks during the journey. At each roadblock, assessment and revision of the rehabilitation programme will be required until the end of the road is reached, i.e. full fitness is achieved. There are often guidelines to follow, set by a surgeon or specialist and also by our knowledge of the healing processes, biomechanics and physiology. To attain optimum healing during the rehabilitation process a certain tension must be applied to the healing tissues in the correct manner, at the appropriate level and at the right time, in order that 'windows of opportunity' are not missed. Regular assessment can help identify these windows and provide an indication about how far along the rehabilitation road the patient has travelled.

As an example: if guidance has been given by a specialist that the patient should not run for 6 months, your assessment will have to acknowledge this limitation. Therefore the plan should not include a goal that would aim to have the patient doing a 100-metre sprint test after 2 weeks. Following an injury to the posterior cruciate ligament in the knee, that has been identified as being a grade II injury, there will need to be a period of immobilisation for 6 weeks. The assessment must respect this, so that the window of opportunity for the ligament to heal at the appropriate length is not missed.

If a rigorous process of assessment is not followed then issues may arise.

The following example highlights where potential issues may arise during the rehabilitation period.

Following a rupture of the Achilles tendon, surgical repair and 6 weeks of immobilisation in a plaster cast the patient was told by the surgeon to walk at the 6-week postoperative check up. At this point the patient could not do so without difficulty, due to reduced range of movement, decreased strength and lack of confidence. The patient had met the time line for the surgeon; however, he had not met any of the essential criteria required for him to be able to walk normally. In any situation where there are changes in the permitted amount of weight bearing, e.g. from non-weight bearing to partial weight bearing, an assessment must be carried out as identified in Table 14.4.

Table 14.4 Example of progression from non-weight-bearing to partial weight-bearing gait

Criteria	Goal	Assessment	Assessment findings	Treatment as Required	Re-assessment	Action	Target Full Weight-bearing
Ankle ROM	Achieve neutral DF	Goniometer to assess ankle ROM	Insufficient dorsiflexion		Neutral DF achieved	Able to walk if other assessment criteria are met	
Muscle length tests		Gastroc. and Soleus tests	Gastrocnemius tests tight		Gastrocnemius = to other leg		
Strength	Calf raise against gravity + some resistance	Oxford scale for muscle strength	Too weak to raise		Standing calf raises		
Balance	Both sides to be equal	a Joint position sense	R=L				
	Both sides to be equal	b Double leg stance	R=L				
	Both sides to be equal	c Single Leg stance	Unable to maintain		R=L		

As the example in Table 14.4 demonstrates, the rehabilitation of injuries such as these must be target led. The therapist must then ensure that the patient progresses to meet the targets. Again using the example of the patient following a rupture of the Achilles tendon, it is the opinion of the surgeon that following removal of the cast the patient should commence walking when safely possible. The knowledge and experience of the therapist agrees with this.

Targets

Targets are set in order for the patient to achieve a normal gait pattern. The criteria must be met and the goals achieved in order for the patient to meet the targets.

- Criterion 1. Muscle length → Goals → Assessment tools → Findings → Treatment → Assessment tools → Target reached
- Criterion 2. Muscle strength → Goals → Assessment tools→ Findings → Treatment → Assessment tools → Findings → Target reached

Criteria are prioritised with the most time consuming or the most demanding at the top. In criterion 1 the priority was identified as muscle length, the goal for this was to achieve neutral dorsiflexion. The assessment tool chosen to measure this was a goniometer, the findings were that the patient did not have neutral dorsiflexion. Treatment was carried out and the resulting increase in dorsiflexion to neutral dorsiflexion meant the patient was able to progress to full weight-bearing (FWB) gait. While the therapist was working to achieve the target for muscle length other criteria were addressed (criterion 2, muscle strength), with the goal being the ability to complete a single-leg calf raise. Strength was assessed using the Oxford grading system, the results show the calf is too weak to walk; therefore the patient is treated with exercises, in an aquatic therapy pool. Following reassessment the goal is achieved. This process is repeated for all criteria until the goals are attained and the target of FWB is achieved.

Monitoring progression

To monitor the progression through the rolling roadblocks there are two assessment processes that are essential;

- Milestone assessment
  Used to measure milestone targets at certain key points during the rehabilitation process, e.g. when a patient moves from non weight bearing to partial weight bearing or from walking to running.
- Daily assessment
  Used on a daily basis to monitor the work level, intensity and load by using certain assessment criteria. This careful monitoring allows the rehabilitation to be progressive without aggravating the injury.

Milestone targets and milestone assessment tools

For serious long-term injuries, such as an anterior cruciate ligament reconstruction, a ruptured Achilles tendon or post shoulder reconstruction five milestone targets are used, with the injury type dictating the timescale for each milestone.

The five main areas used are:

Early assessment

After an initial injury or after surgery the aim is to create an environment to promote healing and to establish homeostasis. Gradual muscle activity is then introduced along with proprioceptive activity (Table 14.5).

Table 14.5 Early assessment milestones

Area of rehabilitation	Assessment tools	Additional information	Targets	References
1 Joint homeostasis	Measure joint circumference Swelling tests Heat		Joint homeostasis	Magee (1997)
2 Pain	Visual analogue scale			Magee (1997)
3 Muscle strength	Manual testing		Grade 2 or 3 mm power	Galley and Forster (1992)
	Baseline measurements of muscle girth			
4 Muscle extensibility + joint range	Goniometer Muscle length tests	This is very often a priority	Normal asap	Kendall et al (1993)
5 Proprioception	Joint position sense	Can often be worked on early	Equal side to side	Herrington (2005)
6 Gait		Video analysis		
7 Anthropometric measures	Shin folds Height weight			
8 Athletic measurements	Hypermobility screening	At this stage tests to monitor athletic performance to be used as base line measurements		
	Musculoskeletal assessment	Leg length, spinal, hip mobility, box test, sij assessment		

Moving between milestones not all targets have to be met at the same time, some may progress quicker than others.

Mid assessment

The priority is to increase muscle strength, improve ROM and move the roadblocks further along the road to recovery. During this period the early phase must not be forgotten, as areas such as joint homeostasis must be monitored. At this stage as the workload increases the daily assessment tools become increasingly more specific and important (Table 14.6).

Table 14.6 Mid assessment milestones

Area of rehabilitation	Assessment tools	Additional information	Targets	References
1 Joint homeostasis	Measure joint circumference Swelling tests Heat		Joint homeostasis	Magee (1997)
2 Balance tests	Walking Lunge Static hops	Observe load video analysis	Sides must be = Good gait stairs	
3 Strength tests	Sets and repetitions	6 rep max etc.		Baechle and Earle (2000)
4 Functional tests	Core timed plank Gluteal bridge Squats Vertical jump	These tests can be away from site of injury and can be tests that were used pre injury	Improve athleticism	

Late assessment and functional assessment

This phase is where the aim of the patient can be considered more closely. Focus is on their job or the sport that they do (Table 14.7).

Table 14.7 Late assessment and functional assessment

Area of rehabilitation	Assessment tools	Additional information	Targets	References
1 Joint homeostasis	Continue to monitor			
2 Joint range and muscle extensibility		Normal or maximum should have been achieved		Kendall et al (1993)
3 Functional tests for strength, balance and co-ordination	Vertical jump Functional movement screen Standing long jump	 Can often be used throughout rehab If you have preinjury data can be a very good indicator of readiness to return	 Pre-injury status	Ageberg et al (2008) Wiklander and Lysholm (1987)
	Star excursion test	Very useful to compare sides	Sides =	Herrington et al (2009) Filipa et al (2010)
	'Y' test	More simple than the star excursion test so can be used more often		
	Cross over hop test	Very good dynamic test		
	Static hop for distance	Good research on this test very useful if have preinjury data		Pincivero et al (1997) Wilk et al (1994)

Return to sport assessment

Returning a player to their sport is driven very much by the sport, injury, position and individual person. The therapist should have standardised tests with can be used as fitness tests at the final stage of rehabilitation before the individual is gradually reintroduced to the sport. For this to happen the functional tests in Table 14.7 must be equal side to side and must match preinjury data, particularly when a player has been out for a long time. Often a 10% deficit compared to preinjury data is considered to be acceptable, but this should be as low as possible before returning the patient to sport.

For lesser injuries such as a muscle strain or a strained ligament a similar process can be followed along the road to recovery, but less milestones may be necessary as the patient may progress quickly to the final target.

Daily assessment tools

The daily assessment tools use both subjective questioning and objective testing. Questions such as: how were you on waking?, how is it now?, how much muscle soreness did you have on waking and how much now?, any swelling?, any pain? The answers can provide useful indicators of progression or deterioration. The objective tests may include; ROM, swelling, heat and gait observation. Together the subjective and objective findings are used to monitor and progress on a daily basis the work being carried out.

Traffic lights

A system that can assist daily assessment is the use of traffic lights with the colours being linked to the results of the subjective and objective assessment.

Green indicates that the previous day's work has not aggravated the joint or site of injury and the rehabilitation programme can continue and progress as planned.

Red indicates that the previous day's work or something that the patient has done has aggravated the area of concern and it means that action must be taken to retrieve the situation. This may involve stopping treatment and allowing the patient to have a complete day of rest, or if the findings are marked then a further clinical opinion may need to be sought. It is essential that the patient discloses anything that they may have done to aggravate the situation and at the very least something will need to be changed in the intervention plan to help the situation.

Amber involves the therapist making a decision about how to modify treatment. The decision will be based on clinical reasoning, drawing on evidence and clinical experience. It means that the previous day's activities have aggravated the area slightly and the therapist must decide what it was about these interventions that caused the aggravation and what to change. If the session the previous day was very demanding then the plan might be to reduce the repetitions, resistance or change the programme. However, if the session was relatively easy, then a more dramatic change may be needed, e.g. a day off, a pool day or a training day to work other areas of the body may be alternatives to be considered.

The system of traffic lights allows the clinician to monitor the workload and make subtle alterations as the process progresses. Using the analogy of driving along a straight road that has many sets of traffic lights, it is the experience of the author that if you encounter the first set of lights on red then you seem to hit them all on red, whereas if the first set of lights is green they all seem to be green and the journey is shorter and more pleasant. This seems to be the same for rehabilitation if in the early stages the daily assessments are green then the patient's journey seems to progress well. If red lights appear early in the patient's rehabilitation programme then this means that there may need to be more investigations to ascertain why the patient has failed to progress and the timeframes for progression are likely to be prolonged.

The frameworks included in this chapter can be used and adapted for all injuries that

require a rehabilitation approach.

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Chapter 14

E-materials

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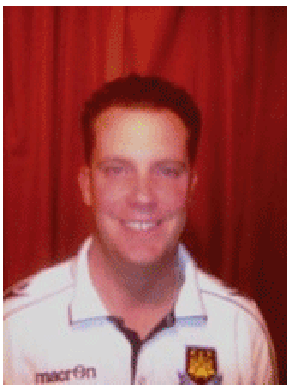
Author profiles

Andrew Rolls MSC BSC(Hons) MCSP

Andy worked in the NHS for a number of years gaining excellent experience in a broad range of practice areas before gradually developing his career in sport with Chelsea FC and in dance rehabilitation working with the English National Ballet. He became a full time sports physiotherapist as the head of medicine at Watford FC and has subsequently taken on the post of Head of Sports Science and Medicine at West Ham United FC.

During Andy's career he has developed a special interest in rehabilitation and how to progress rehabilitation as an objective process, in order to take the guesswork out of rehabilitation.



Captain Mark Jenkins MSc BSc(Hons)

MCSP RAMC

Defence Medical Rehabilitation Centre, Headley Court, Epsom, Surrey.

Mark studied Sport and Exercise Science at Loughborough University before completing his physiotherapy training at Kings College London.

He has been a Physiotherapy Officer in the British Army for 5 years, gaining experience in rehabilitation working with Headley Courts complex trauma teams and multidisciplinary injury assessment clinics, as well as on operational tours in Iraq and Afghanistan.

He is currently Officer in Charge of the Army's Primary Care Rehabilitation Facility in London.

Major Jayne Nixon BSc(Hons) Dip Sport Ex Med MCSP

Jayne is a Lower limb Specialist and Clinical lead at Defence Medical Rehabilitation Centre Headley Court. She has been a physiotherapist for 17 years and has both NHS and Military experience.

Jayne has a diploma in Sports Medicine and is currently completing her MSc. She is a member of the Territorial Army and has been deployed as a physiotherapist both to Iraq and Afghanistan. She has a special interest in Trauma of the lower limb and exercise induced leg pain.

Davina Richardson MSc BSc(Hons) MCSP

Davina is the Clinical Lead Therapist for Neurosciences at Imperial College Healthcare NHS Trust. Davina has worked extensively in the field of rehabilitation in Neurology, Elderly Care and the Community both abroad and in the UK. Davina has been involved in setting up Multi-disciplinary teaching programs in Rehabilitation and has presented material on the International Classification at several International conferences.

Case Study 14.1 Neurorehabilitation

Background

- 55-year-old female with a presentation of neurofibromatosis.
- Worked as a film editor full time, drove to work. Lives with her husband and family in a town house with stairs.
- She enjoys cycling and walking.
- Prior to onset two years ago she had suffered no major symptoms from the condition.
- Two years ago she underwent a cervical laminectomy C5/6 to relieve S&S of spinal cord

compression.

- Six months after this she underwent further surgery in the lumbar spine at levels L1/2 and L3/4.
- She was referred for rehabilitation following surgery as an inpatient (2 weeks), then transferred to outpatient community services (8 weeks).

Assessment findings

- Reduced sensation in both hands and feet.
- Reduced strength in both upper and lower limbs.
- Reduced range of movement in the neck and lower back.
- Altered balance responses.
- Unstable bladder with urgency and frequency of micturition.
- Poor posture.

ADL, restrictions identified at assessment

- Difficulty with dressing, washing, feeding and writing.
- Difficulty walking, frequent falls and needing assistance of two sticks.
- Unable to return to work.
- Unable to cycle.

Treatment aims

- Improve and maintain existing muscle length and strength in the arms and legs whilst working on improving balance reactions and function.
- Prior to working on the cervical and lumbar spine range of movement the physiotherapist checked with the neurosurgeon regarding any limitations or restrictions. None were identified, so treatment also targeted gentle progression of range of movement in the neck and back.

Upper limbs and balance

- Throwing and catching balls initially in sitting with the ball thrown from a short distance to standing and throwing from further away. Gradually increasing the difficulty of the task, once previous task was mastered. Combined work on muscle strength and co-ordination with automatic balance worked well. The size and shape of the ball was used to increase or decrease the difficulty. Progressed to standing.
- Fine hand work targeted function. Peg boards, handwriting, paper folding, griping objects provided stimulus for the hand function. Some compensatory strategies were involved to

allow for success, e.g. adaptation of the pen, knife and fork grips. Improvements occurred as a result of practice and the adaptations were reassessed.

- Postural advice and education was provided at every treatment session together with some general advice on shoulder girdle movements including elevation and depression and elevation through flexion and abduction.

Short-term goals for upper limb functioning

- To be able to use a knife and fork effectively in 4 weeks.
- To be able to do up buttons in 2 weeks.

Long-term goals for the treatment as a whole

- To be able to wash and dress independently in 8 weeks.
- To be able to use a keyboard effectively to participate in some form of work activity in 8 weeks.

Lower limb work and general reconditioning

- All muscle groups were active, but weak.
- Strengthening using sit to stand, increasing the repetitions and changing the speed from fast to slow and slow to fast. Using hands and arms to assist initially, progressing to no assistance.
- Getting on and off the floor to reduce the anxiety and fear of falling.
- Walking practice to increase distance, speed and exercise tolerance.
- Timed 10-metre walking, initially with 2 sticks progressing to 1 stick.
- Stretches taught for all muscle groups.
- Home exercise programme taught and checked, with progression daily/weekly.

Short-term goals for lower limb and balance

- To be able to sit to stand for 2 minutes with arms folded in 1 week.
- To be able to come up and down on tip toes without holding on to support in 2 weeks.

Long-term goals

- To reduce frequency of falls to zero in 1 month.
- To return to work, part time, in 2 months.

Case Study 14.2 Complex trauma

Background

- 22-year-old, right-handed sniper who has served 3½ years in the Army.
- Lives alone in base accommodation.
- The following injuries were caused by an improvised explosive device (IED) whilst on duty in a combat situation 1 year ago:
  - Traumatic right through knee amputation
  - Partial right hand amputation, 3rd to 5th fingers
  - L1 stable transverse process fracture.
- He underwent multiple operations for debridement of wounds.
- His right wrist was fused and the ulna head was excised.
- EDC was repaired in the right hand and the wound was covered and reconstructed with a left serratus anterior free flap.
- He had full memory of the incident, but was experiencing little in the way of flashbacks or nightmares.
- He was reviewed by cardiology for a sinus tachycardia.

Rehabilitation

- Following the acute hospital management he was transferred to rehabilitation.
- He was experiencing low mood and anger issues at this point as his right wrist wound had deteriorated and metalwork had begun to protrude.
- An X-ray suggested osteomyelitis in the distal radius and consequently the metalwork was removed and bone grafts inserted, prior to him beginning his rehabilitation programme.

On assessment

- His observations were stable and there were no chest or heart problems.
- All wounds were closed.
- He was on the following pain relief medication: MST 20 mg OD and Pregabalin 300 mg BD.

Identified problems

- Prosthetics fitting.
- Soreness of the stump, pressure pain from the socket fit.
- Gait disturbance – slight Trendelenburg in walking.
- Poor gait on steep slopes and stairs.
- Decreased hip strength – glut med 4/5, glut max 4/5.
- Decreased quads strength 3/5.
- Poor balance and proprioception.
- CV fitness.
- Core control problems.
- Poor hand function.
- Poor grip and writing – 9 Hole Peg Test on admission; right – 50.3 seconds left – 21.6.
- E-Link Grip Strengths; on admission – 75.5%.
- Problems finding his COG in swimming.
- Mood, sleep and anger issues.
- Long-term occupational issues.

Identified goals

- His main goals were:
  - To improve his balance and gait and progress to running
  - Be able to write his name and address with his other hand in one month.

Treatment aims

- Improve prosthetic fit to enable efficient walking and running.
- Increase hand stereognosis and ROM of the remaining part of the hand.
- Improve swimming pattern, to achieve balance in water.

Week 1

- Daily treatment.
- General progressive strengthening exercises for hip stabilising muscle groups and quads.
- Core stability exercises on Swiss ball and BOSU ball.
- Walking re-education, starting with PPAM aid, progressing to socket.
- Active assisted stretching exercise for the hand and passive mobs for the remaining joints to improve flexion.
- Active exercises for the dexterity of the hand including functional tasks and writing with the OT.
- Balance and proprioception in sitting and standing using Swiss ball and wobble board (sitting).
- Aquatic therapy to gain balance in water and buoyancy resisted work for hip and core.

- Soft tissue treatment on the stump, using silicone on scarring.
- CV work for 20 minutes on hand bike or in the pool.
- Advice on pain management.
- Sleep advice.
- Anger management with CPN.

Week 2

- Daily treatment.
- Increased resistance strength exercises using resistance bands and weights.
- Core control work with less points of contact on the floor and more movement patterns.
- Walking re-education on new socket and on crutches with one arm in a modified crutch out of the parallel bars.
- Gait re-education with a mirror to overcome Trendelenburg.
- Weight transference exercises.
- Metacentric water exercises in pool.
- Taught to do own soft tissue exercises.
- Myofascial treatment on upper limb and stump.
- Balance exercises in standing, e.g. throwing and catching in sitting on the ball and in standing.
- Active stretching and serial splinting of the hands to ensure joint position is improved and maintained.
- Functional strength exercises for the hand and forearm.
- Continued sessions with CPN.
- Referred to OT for occupational issues and planning.
- Engaging in talking about sports and adventure opportunities.

Week 3

- Daily treatment.
- As week 2 for strength plus additional positions and resistance.
- Progressing to walking with one stick out of the bars and increasing distance to 300 m.
- Increasing aquatic work including swimming strokes.
- Fine motor control work for the hand.
- Education on nutrition, health and pain management.
- Taught and practised use of knife and fork and pen by OT.
- Taught and practised stairs and slopes.
- Taught how to hold a golf club and swing.

Outcomes

- The patient was very compliant in physiotherapy and attended all sessions.
- He worked hard to improve his balance and control his hip muscles on the right.
- He managed steep slopes and stairs with ease.
- He was still slightly unsteady when walking heel to toe forwards and backwards, but continued to improving.
- The Trendelenburg gait was corrected, which improved his gait with one stick.
- He occasionally complained of pain, but his understanding of phantom pain enabled him to cope with this.
- He found that he enjoyed golf and despite initially finding gripping with his right hand difficult he adapted well and his game improved.
- He reported enjoying this and wanted to continue playing in his own time.

Future

- The plan for the next months was to continue with balance training and trunk control when weight transferring, to enable him to progress gait training to running.
- Details:
  - Complete kitchen assessment with OT, looking at what functions he needs to gain for his hand movements
  - Complete upper limb standardised assessments and recommence e-link programme
  - Complete onward referral CPN
  - Running re-education and fitting for the running prosthetic
  - Plan for gradual return to work with the aid of the OTs and social workers
  - Continue with education and encouragement with sports and referral to adaptive sport
  - Encouragement to go to a local gym to work on the exercise programme.

Case Study 14.3 Sports injury

Background

- This case study outlines the first three months in the management of a 19-year-old student who sustained an anterior cruciate ligament (ACL) rupture.
- He played semi-professional rugby and had aspirations to becoming a full-time professional player.
- The ACL was ruptured in a rugby match and was reconstructed using a patella tendon graft.
- He then attended for physiotherapy in a sports clinic 6 weeks post operation with little or no prior rehabilitation input from any professional source.

Initial assessment findings

- The knee was very swollen.
- He has lost 10° of knee extension actively and had no hyperextension either actively or passively.
- He had 70° active flexion.
- He experienced some pain on knee movements.
- All ligament tests were good and the ACL graft seemed tight and strong and all meniscal tests were negative.
- He was very nervous and concerned.

Evaluation using the traffic light assessment tool

- Using the traffic light process outlined in the rehabilitation assessment chapter it was evident that the situation was reds and therefore required urgent action (Table CS14.1).
- This prompted the plan to stop the patient doing any activities in order that the leg was allowed to rest appropriately.
- A night splint was provided to protect the knee and to assist in getting full knee extension.
- A discussion was held with his surgeon, so he was aware of the situation and to pre-empt an appointment if it did not improve in the required timeframe.

Table CS14.1 Traffic light assessment at 6 weeks postoperation

Subjective assessment	Objective assessment	Traffic light colour	Action taken
All good	All good	Green	Continue to plan
Some pain or discomfort	Slight increase in swelling and heat and/or decreased ROM	Amber	Change something
Increase in Pain and swelling Patient knows something is not right	Large increase in swelling Joint is hot Decreased ROM Gait poor	Red	Drastic change to plan needed

Initial rehabilitation

- Therefore the priority for the first few sessions was to explain the rehabilitation process to him in order to instil some confidence.
- He was reassured when told that if he followed the guidelines the knee would improve.
- For 6 weeks, i.e. up to 3 months postoperation, the sessions included gentle mobilisation techniques to regain range of motion especially for knee extension (Table CS14.2).
- Of equal importance was what the patient did when not attending the clinic.
- Strict rules were set as follows:
  - He was permitted to walk to college, elevating the leg as often as possible when there
  - No other walking was allowed expect in his house
  - Ice was to be applied 10 minutes on 10 minutes off 10 minutes on, 5 times per day
  - Active exercises were given for him to do 3 times daily
  - Driving was limited
  - An extension splint was to be used for the first 2 weeks, with one hour on and one hour off, in conjunction with a night brace
  - Compression bandages were to be used regularly
  - He was given some very simple balance exercises, but avoided specific strengthening work.
- The progress was monitored using daily assessment tools.
- At his 3 months surgical check up he had minimal fluid around the knee, usually as a result of being on his feet too much.
- He had full knee extension with hyperextension and he had reached 100° of flexion, which was gradually improving.
- The surgeon advised pushing on gradually with the proposed rehabilitation.
- As joint homeostasis was more settled the early assessment table was used to plan the management at this stage (Table CS14.3).
- Subsequently the goals were identified as:
  - Maintaining joint homeostasis and reducing pain (only present towards the end of the day at this stage)
  - Improving balance, including improving his gait pattern
  - Maintaining knee extension and increasing flexion
  - Start to work on specific strength of the lower limb.
- Once joint homeostasis was achieved the range and strength become much easier to improve through intervention.
- The patient progressed quickly and returned to training for rugby after 8 months, initially in a non-contact capacity.

Table CS14.2 Initial goal-led treatment plan

	Criteria	Goal	Assessment	Findings of assessment	Treatment
1	Knee joint homeostasis	No swelling	1. Swelling tests 2. Joint circumference measurements	Homeostasis poor Swelling Joint size much larger than other knee	Advice on PRICE
2	Knee extension	Hyperextension to match other knee	Goniometry to measure range	Lacking 10° active and lacking all hyperextension	Advice on resting positions Physiotherapy mobilisations Soft tissue stretching
3	Knee flexion	Full range of movement	Goniometry to measure range	Lacking flexion	Not worked on yet as there is too much swelling in knee, so just maintained by gentle mobilisations
4	Pain	No pain	VAS at rest, on waking, at end of day and on walking	Too much pain	Contacted surgeon who recommended paracetamol and a course of NSAIDs
5	Mental state	Confident in knee	Conversational assessment	Nervous and concerned	Spent time to explain what we needed to do and how we could slowly improve this situation

Table CS14.3 Use of the early assessment table to plan the appropriate intervention for the patient

	Area of rehabilitation	Assessment tools	Targets	Comments	References
1	Joint homeostasis	Measure joint circumference Swelling tests Heat	Joint homeostasis	See daily assessment tools later in chapter	Magee (1997)
	Pain	Visual Analogue Scale			Magee (1997)
2	Proprioception/Balance	Joint position sense	Equal side to side	UL	Herrington (2005)
3	Joint ROM/Muscle length	Goniometry joint assessment	Equal side to side		
4	Muscle strength	Manual testing Baseline measurements of muscle girth	Grade 2 or 3		

Chapter 14 Rehabilitation multiple choice questions

1. A patient is referred for treatment of a right foot drop. Which of the following is not a cause of the foot drop?
   a). L 5 radiculopathy
   b). Sciatic nerve injury
   c). Femoral neuropathy
   d). Stroke
2. A patient is referred for treatment of a painful shoulder with associated restricted mobility. Which of the following is less likely to cause pain and restricted mobility?
   a). Accessory nerve injury in the neck
   b). Brachial neuritis
   c). Weakness of lower trapezius
   d). Acromioclavicular dislocation.
3. Which of the following is incorrect? A woman with a torticollis to the right side may:
   a). Have increased tone in the right sternocleidomastoid muscle
   b). Respond to injection of botulinum toxin into the left sternocleidomastoid muscle
   c). Have a chance of developing dysphagia, if injected with botulinum toxin
   a. Have associated visual impairment
4. Which investigation might be useful in informing the prognosis of an individual with a metabolic peripheral neuropathy?

a). MRI brain
b). MRI spine
c). Nerve conduction studies
d). Lumbar puncture

5. What assessment should be carried out daily for a patient with GBS who has just been weaned from the ventilator and is slowly improving?
   a). Manual muscle strength testing of the upper limbs
   b). Vital capacity
   c). Sensory level testing
   d). Hospital anxiety and depression score
6. A 40-year-old lady has multiple sclerosis. Severe leg adductor spasms cause uncontrollable bladder voiding. The level of her antispasticity medication is currently being adjusted to attain the appropriate dose. She has difficulty transferring; poor sitting balance and peroneal hygiene issues. What would you consider would be best practice for the management of her bladder at this time?
   a). Antimuscarinic medication
   b). Clean intermittent self catheterisation
   c). Urodynamics
   d). Indwelling catheter
7. Using daily assessment tools, if the situation is deemed red you should:
   a). Continue as planned
   b). Change something minor
   c). Do nothing
   d). Take immediate action that may involve the doctor
8. After a musculoskeletal Injury the first priority is to work on:
   a). Achieving injured area homeostasis
   b). Increasing strength of injured area
   c). Stretching tissues around injured area
   d). Keeping the athlete fit
9. Ice should be applied for:
   a). 30 minutes in one go
   b). 10 minutes on, 10 minutes off and then 10 minutes on again
   c). Any duration as long as the area is cooled
   d). 5 minutes on every hour
10. When introducing a 'Balance Challenge' to an exercise:
    a). The load should initially be removed
    b). The load should be increased
    c). The load should be maintained
    d). The load should be decreased
11. The acronym 'PRICE' used in the initial stages of injury management stands for:
    a). Protection, rest, ice, compression, exercise
    b). Protection, rest, ice, compression, elevation

c). Protection, restriction, ice, compression, elevation
d). Passive movements, rest, ice, constrict, elevation

12. When progressing exercises:
    a). The load should be added before a balance challenge is introduced
    b). A balance challenge should be the first stage
    c). It is important to increase the load as quickly as possible
    d). When introducing an exercise always add load after the balance challenge has been introduced
13. When assessing the complex trauma patient which statement is true?
    a). Work independent of other clinicians
    b). Take a holistic approach using available resources and the MDT
    c). Formulate any plans away from relatives and the patient
    d). Only consider the physical aspects of rehabilitation
14. Complex trauma consists of which one of the following?
    a). Multiple fractures and psychological injury only
    b). Neural and soft tissue injury with some fractures only
    c). Emotional and psychological injuries with amputations only
    d). Any combination of physical, emotional and psychological injury
15. When assessing multiple fractures which of the following is *not* true?
    a). You would always check weight-bearing status
    b). All patients will experience non-union
    c). Peripheral nerve and soft tissue injury may accompany fractures
    d). Understanding patient's goals and a good subjective history is essential
16. When setting goals in complex trauma, which of the following statements is true?
    a). Do not raise expectations, as recovery will be limited
    b). Let the patient's family decide what will be an achievable goal
    c). Assess each patient on a case-by-case basis aiming for the highest possible function
    d). Only plan day by day
17. Which of the following is *not* a complication of transfemoral amputation?
    a). Phantom limb pain
    b). Heterotopic ossification
    c). Brachial plexus injury
    d). Infection
18. In hypersensitivity and allodynia associated with nerve injury, which of the following is *not* a treatment?
    a). Neural suppressing drugs
    b). Desensitisation techniques
    c). Acupuncture
    d). Deep tissue massage
19. Which of the following is *not* a neuromuscular disorder?
    a). Charcot–Marie–Tooth disease
    b). Multiple sclerosis

c). Duchenne muscular dystrophy
d). Amyotrophic lateral sclerosis

20. Patients that have undergone a patellar tendon repair for a ruptured ACL are more likely to have:
    a). Greater weakness in the VMO contraction
    b). Take longer to regain full ROM in the knee
    c). Tend to be less painful than other reconstruction methods post operatively
    d). May experience patella tendonitis during the rehabilitation period

Rehabilitation multiple choice answers

1. c)
2. c)
3. b)
4. c)
5. b)
6. d)
7. d)
8. a)
9. b)
10. a)
11. b)
12. a)
13. b)
14. d)
15. b)
16. c)
17. c)
18. d)
19. b)
20. d)

Chapter 15

Rheumatology

Introduction

- Rheumatology covers a wide range of conditions affecting the musculoskeletal system including all types of arthropathies and soft tissue conditions such as tendonitis and bursitis.
- Also included are less common auto-immune conditions such as connective tissue disorders and vasculitis.
- Many long-term conditions can be managed by different specialist areas of physiotherapy.
- Chronic pain management may be managed by pain specialists in some geographical areas, whereas in others a rheumatology service will have the remit for managing chronic pain.
- Physiotherapy for rheumatological conditions is built upon the core skills that are used in all areas of musculoskeletal practice.
- This volume anticipates that the reader will possess a basic level of knowledge and experience of musculoskeletal assessment, i.e. that they will be able to carry out an assessment of joint range or muscle power.
- The material in the volume will guide the reader in how they may apply core skills in the assessment of patients with inflammatory arthritis.

Current trends in management of inflammatory arthritis

- The medical treatment of inflammatory arthritis is a rapidly developing area of healthcare.
- In the recent past there have been major advances in drug treatment offering significant improvements in long-term function and disease management within inflammatory arthritis.
- Whereas in the past a physiotherapist would expect to see large numbers of patients with significant disability levels, these are now being encountered less frequently.
- Due to these changes the role of the rheumatology physiotherapist is sometimes poorly understood and appreciated within the profession.

The purpose of assessment

Identification of potential case of currently undiagnosed inflammatory arthritis

- Increasing numbers of patients are choosing to self-refer to physiotherapy. This means that physiotherapists can often be a first point of contact for a patient with an undiagnosed rheumatological condition (Cleland and Walter-Venzke 2003).
- Early diagnosis and treatment is the basis of modern rheumatology, any suspected cases of new inflammatory arthritis should be referred to specialist services.
- Box 15.1 outlines the National Institute for Health and Clinical Excellence (NICE) guidance for the early referral of suspected new cases of rheumatoid arthritis (NICE 2009).
- It is important to ask specific questions during the assessment which can help identify the presence of inflammatory back pain.
- It is worth noting that with inflammatory arthritis of peripheral joints or the axial skeleton there is no single definitive diagnostic test which can be used; diagnosis is achieved through a combination of examination, considering the features that the patient presents with (Box 15.2), history taking and the appropriate application of specific diagnostic tests and techniques.

Box 15.1 Guidance for early referral of suspected cases of rheumatoid arthritis

Refer for specialist opinion any person with suspected persistent synovitis of undetermined cause. Refer urgently if any of the following apply:

- the small joints of the hands or feet are affected
- more than one joint is affected
- there has been a delay of 3 months or longer between onset of symptoms and seeking medical advice (NICE 2009)

Box 15.2 Features of inflammatory arthritis

- Tender, warm, swollen joints
- Symmetrical pattern of affected joints
- Joint inflammation *often* affecting the feet, wrists and finger joints
- Joint inflammation affecting other joints, including the neck, shoulders, elbows, hips, knees, ankles, and feet
- Fatigue, occasional fevers, a general sense of not feeling well
- Pain and stiffness lasting for more than 30 min in the morning or after a long rest
- Symptoms that last for many years

- Variability of symptoms among people with the disease (NIAMS 2009)

Assessment and diagnosis of inflammatory arthritis

- This will be significantly influenced by the involvement of other health professionals, the phase of drug treatment the patient is in, the disease process, and ultimately the patient's expectations and aspirations.
- Physiotherapists will invariably practice within a multidisciplinary team, usually comprised of:
  - Medical staff
  - Nurses
  - Occupational therapists (OT)
  - Dieticians
  - Orthotists
  - Podiatrists
  - Psychologists
  - Pharmacists (Luqmani et al 2009).

Review assessment

- These tend to be undertaken as part of a regular planned review process of patients with rheumatoid arthritis and ankylosing spondylitis by a rheumatology team, in accordance with the NICE guidelines (NICE 2009).
- ASAS/EULAR recommend that the frequency of monitoring in ankylosing spondylitis (AS) should be decided for each individual patient based on symptoms and disease severity (Kiltz et al 2009).

Triage assessment

- This is a developing area for physiotherapists working within a rheumatology team. Additional training in specific diagnostic and therapeutic skills has expanded the role of the rheumatology physiotherapist in a way that has been established in orthopaedics for a number of years (Weatherley and Hourigan 1998, Pearse et al 2006).

Subjective assessment

- It is important to record information on a body chart (Figure 15.1). This provides a

baseline of the patient's symptoms on the first attendance which should change in response to physiotherapy intervention.

- Central to the whole assessment process is the interaction between clinician and patient.
- At the beginning of an assessment it is essential to establish a rapport with the patient, provide explanations about what the assessment entails, and obtain their consent.
- Consent is an ongoing, interactive process that will need to be sought throughout the assessment and subsequent treatment (CSP 2005).

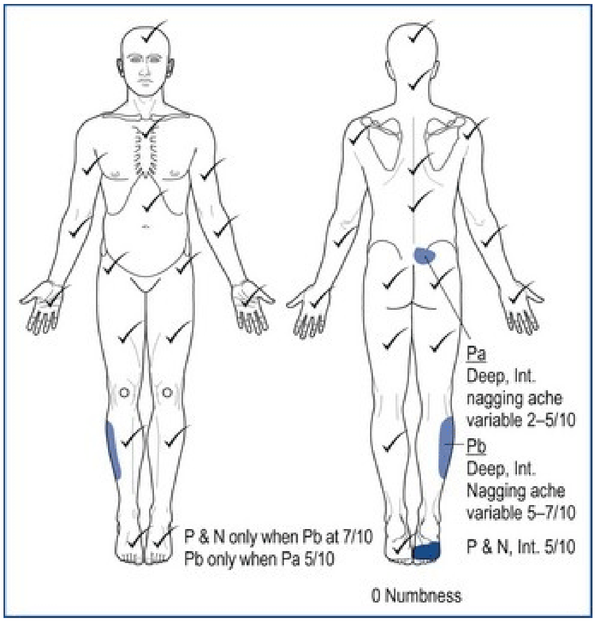


Figure 15.1 Body chart for recording presence of a patient's symptoms.

Patient-defined problems, health beliefs, expectations and mood

- Gaining an understanding of the impact of the condition on the patient's function and lifestyle is crucial to the therapeutic process.
- This will have a direct bearing on the short- and long-term physiotherapy interventions and the patient's undertaking of 'self management'.
- A general evaluation of mood can be useful to consider if a patient seems depressed or anxious.
- Use of validated measures such as the Hospital Anxiety and Depression Scale (HADS) may identify affected mood in appropriately selected patients (Zigmond and Snaith 1983).
- Function can be affected in inflammatory arthritis, causing some tasks to become difficult and others impossible (Table 15.1).

- A number of validated measures exist to evaluate this, for example the Health Activity Questionnaire (HAQ) (Fries et al 1980).
- At times it can also be useful to assess health-related quality of life using validated measures such as EQ5D (The EuroQoL Group 1990).
- Throughout the assessment it is necessary to consider how the various aspects of functional impairment relate to the underlying rheumatological condition and what is important to the patient.
- During any discussion of function it is important to identify how the skills of the physiotherapist may assist the patient with their functional activities and where other professions may have a role to play.
- Major functional limitation may entail referral to an occupational therapist. Good team communication and working is essential here.

Table 15.1 Potential functional impairments in rheumatological conditions

Peripheral joints	Axial skeleton
Using a toilet, getting in or out of a bath Washing hair, cleaning teeth Dressing Climbing stairs Walking, speed, distance and rhythm, on uneven or unstable surfaces Household activities, e.g. Cooking Opening packets and jars Picking up and using keys Writing Driving Hobbies, e.g. knitting Care activities for others, e.g. dressing children Sports performance Paid employment	Getting out of bed in the morning Putting socks on in morning Back stiffness after prolonged sitting Back stiffness after prolonged standing Reaching high cupboard or washing line Lifting and carrying Rolling in bed Driving Reversing when driving Walking speed, distance and rhythm

Pattern of joints affected by rheumatoid arthritis

- Inflammatory arthritis will typically develop a characteristic pattern of joint involvement.
- A rheumatology body chart can be used to record specific joint palpation finding (warmth, pain swelling).
- It can be useful to have larger hands because of the relatively high occurrence of arthritis in this area and therefore facilitate the recording of greater detail (Figure 15.2).

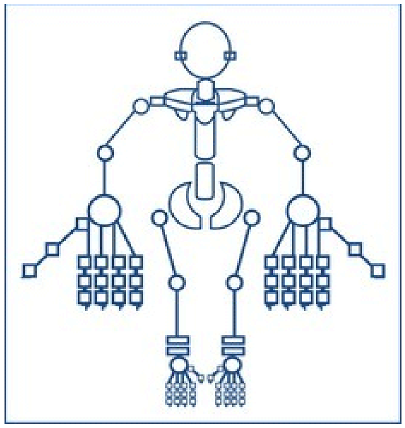


Figure 15.2 Example of a Rheumatology bodychart.

Behaviour of signs and symptoms

Swelling/temperature

- The pattern of painful and swollen joints in inflammatory arthritis can vary for the different types of arthritis.
- Given the often protracted nature of the problems before the assessment, patients can sometime lack precision in describing swelling and other features.
- A feature of the spondyloarthropathies is dactylitis (swelling of a whole digit), and in acute arthritis joints can appear warm.

Joint stiffness

- The stiffness associated with inflammatory arthritis is typically worse after periods of immobility.
- Significant times for this are getting out of bed in the morning, getting up after prolonged sitting and sustaining a fixed position.
- Morning stiffness of more than 30 minutes is an important diagnostic feature of inflammatory arthritis, but the stiffness duration can sometimes be shorter.
- In the context of discussing pain and stiffness it can often be helpful to take the patient through a typical day to allow them to highlight the variation in the symptom pattern, which in inflammatory arthritis will tend to be worse in the first half of the day.

Pain

- It is helpful to define the areas affected as precisely as possible. In arthritis the pain, stiffness and swelling often coincide within the same general area.
- In chronic rheumatological conditions pain may seem confusing because the patient may report pain associated with inflammation in a specific joint and also arising from

secondary degenerative changes, other long-term but uninvolved conditions, or pain which might lack a specific physical cause.

- Noting the patient's description of pain can help to determine the structures involved, e.g. sharp and shooting may indicate nerve root involvement.
- Note the behaviour of the pain in response to movement and activity, also the patient's beliefs about their symptoms.
- Patients may also report pain and swelling at the entheses (the insertion of tendons into bone), known as enthesitis. If a spondyloarthropathy is suspected or diagnosed there is the possibility of enthesitis occurring (Colbert 2010). This can be assessed by careful palpation and using an enthesitis index Appendix 15.1. Experienced clinicians should be aware of false responses due to the natural discomfort of palpating these areas.
- It is important to differentiate between mechanical and inflammatory causes of back pain and therefore screening questions need to be included in the assessment to identify undiagnosed inflammatory back pain (Box 15.3).

Box 15.3

Screening questions for suspected inflammatory back pain

- Early morning stiffness, back and/or neck >30 min (mechanical back pain often lasts for a shorter time)
- Pain improves with exercise? (mechanical is often worse)
- Awake 2nd half of night with pain/stiffness?
- Alternating buttock pain?
- Age under 45 at onset? Frequently in twenties/thirties at onset (mechanical often has later onset)
- Close relatives with inflammatory arthritis?
- Better on gentle movement rather than rest? (mechanical often better at rest)
- Stiffness after sitting? (mechanical often increased pain on sitting relieved by standing)
- History of one or more the following might be present:
  - Iritis (painful inflamed eye)
  - Achilles tendonitis
  - Plantar fasciitis
  - Inflammatory bowel disease
  - Psoriasis

Calin et al 1977, Rudwaleit et al 2005, Clemence 2010.

Muscle function

- In common with other conditions inflammatory arthritis is typically associated with reduced power and muscle control.
- This will be most evident to the patient as difficulty performing previously problem free functional activity.

Fatigue

- Fatigue reported within an inflammatory arthritis can be directly associated with the pathological process.
- It can also result from the 'deconditioning' effect of having a long-term heath problem (loss of aerobic fitness and muscle power).
- In addition reports of fatigue can be a physical description of psychological states such as depression.

Red flags

In cases of acute back pain the following can indicate serious pathology:

- Past history of malignant cancer
- Progressive neurological symptoms
- Saddle anaesthesia, cauda equina syndrome
- Bladder or bowel dysfunction, especially alteration of sphincter control
- Fever and unexplained weight loss
- Structural deformity
- Systemically unwell, immunosuppression, drug abuse
- Constant progressive, non-mechanical pain
- Thoracic pain
- Violent trauma
- Age of onset less than 20 or more than 55 years.
- Prolonged use of corticosteroids (Moffett and McLean 2006).

Specific red flags in rheumatoid arthritis

- Sepsis
- Drug toxicity
- Cervical spine instability
- Systemic rheumatoid vasculitis
- Unexplained weight loss and lymphadenopathy as a feature of other systemic disease, e.g. lymphoma or amyloid
- Exacerbations of respiratory or cardiac disease (Luqmani et al 2009).

Other aspects of history taking

- It is standard practice within all areas of physiotherapy to record the patient's past medical history, current medication and social history.
- Social situation can affect and be affected by a rheumatological condition; given that most conditions are chronic, there can be long-term implications for maintaining social

function.

Symptom diaries

- Rheumatology patients who have diverse and variable symptoms or who are poor historians may be able to collect information about their symptoms by keeping a diary.
- This may delay completion of the initial assessment, but can provide much more coherent information about the symptoms being experienced by the patient.
- These have been used to gain a better understanding of pain presentation in oncology patients, respiratory tract illnesses and paediatric conditions (Schumacher et al 2002, Holmes et al 2001, Palermoa et al 2004).

Drug history

- The drug history is of particular relevance in rheumatology because medication forms the basis of controlling the condition. Common areas for consideration follow.

Phase of drug treatment

- Some drugs used in rheumatology have a time delay before therapeutic effects occur, e.g. methotrexate (one of the commonest used) can be up to 12 weeks.
- The patient's condition on later assessment might be different from initial contact if they have only just commenced medication at time of first contact.

Corticosteroids

- These have the potential to rapidly suppress the inflammatory process and so are sometimes used as a short-term treatment to subdue a particularly aggressive acute inflammatory arthritis before the long-term treatment gains full effect.
- If a patient is assessed during the phase of maximum suppression from corticosteroids the clinician can sometimes gain a false impression about the presentation of the disease.

Disruption of drug treatment

- Often this is due to problems with self-administered injections, home drug delivery, obtaining repeat prescriptions, misunderstanding about dose escalation, interruption of treatment and misunderstanding of previous advice.

Drug side effects

- All drugs have side effects. It is outside the scope of practice for most physiotherapists to provide detailed advice about drug use for rheumatological conditions.
- If a problem is identified during assessment then it is important to liaise with the appropriate team member.
- Rheumatology departments will normally have specialist nurses who provide advice about medication.
- It is inadvisable for physiotherapists to use written sources such as a British National Formulary (BNF 2010) to resolve uncertainties.
- If in doubt seek advice.

Objective assessment

- Objective examination in rheumatology shares much common ground with those conducted within general musculoskeletal practice and orthopaedics.
- The purpose of assessment is to identify the problems, understand their relevance to the patient, and formulate a plan for intervention.
- Currently there is no consensus about which is the most effective process for the assessment of patients who have known rheumatological conditions.
- The physiotherapist needs to make considered decisions about the objective information that needs to be gathered during the rheumatology assessment process.
- Physiotherapy assessment within rheumatology requires a sophisticated approach that is not compatible with asking the patient standard questions and performing set observations.
- Medical musculoskeletal examination has tended to follow the rough outline of 'look, feel, move' (Hassell and Cushnaghan 2010). However, conditions such as inflammatory arthritis or connective tissue disorders are diffuse diseases affecting other body systems alongside the musculoskeletal system and they can affect a number of areas of the body simultaneously.
- There is an inherent tension during the assessment between the need to get an overview of multiple functional problems and getting the specific information about the issues affecting a single component within the musculoskeletal system.
- A skill that the rheumatology physiotherapist needs to develop is knowing what to include and what to leave out in the objective plan, a process that is constantly refined through the application of clinical reasoning and increasing experience.

Observation

- The physiotherapist will need to decide how much of the patient they need to observe in

order to inform clinical decision making. This decision will be made according to the purpose of the assessment.

- The patient needs to understand what the assessment will involve and consent to being assessed. Ideally the patient would be observed in standing from anterior, posterior and both lateral directions, in their underwear to visualise the limbs and skin surface (Box 15.4).
- An alternative to doing this is to observe different regions one at a time enabling the patient to remain covered in order to respect patient dignity or cultural needs.
- Patients with rheumatoid and psoriatic arthritis will often have hand joint involvement which can make dressing difficult, so this needs to be considered.

Box 15.4 Observation (adapted from Arthritis Research UK 2011)

In standing from head down

General observation of body shape, size and appearance
Signs of general neglect
Skin, colour, condition
General symmetry
General speed and freedom of movement
Signs of surgery/trauma, scars

Anterior and lateral views

Cervical protrusion and lordosis (ankylosing spondylitis, cervical degeneration)
Cervical/shoulder asymmetry
'Dowager's hump'
Muscle spasm
Shoulder muscle bulk
Elbow flexion deformity
Lumbar lordosis
Hip flexion deformity
Quadriceps muscle bulk
Knee valgus/varus
Knee flexion deformity
Knee swelling
Ankle/forefoot positions/hindfoot/foot pronation/supination
Toe deformity/clawing/crossing
Toe dactylitis (inflammation of an entire digit)

Posterior view

Cervical position and symmetry
Shoulder muscle bulk and symmetry
Scapular position
Spinal alignment – scoliosis, iliac crest/posterior superior iliac spine symmetry
Elbow joint swelling
Gluteal muscle bulk
Posterior knee joint swelling
Calf muscle bulk
Ankle joint swelling
Ankle/hind foot position, over pronation, tendo-Achilles alignment
Weight distribution

Wrist and hand

These benefit from detailed observation and examination
Pattern and severity of joint swelling, finger dactylitis and skin changes
Deformities in established rheumatoid arthritis: ulnar deviation, swan neck and boutonniere deformities
Osteoarthritis: Heberden's nodes

The skin appearance

- Psoriasis, rashes, other skin lesions.

Swelling, deformity, asymmetry, body shape or size

- It is also useful at this stage to note the overall appearance of the patient.
- When there are signs of poor personal care this can indicate potential problems with activities of daily living (ADL) due to joint dysfunction, especially hands or upper limbs.

Assessment of movement (general)

- Time constraint or the acute nature of the patient's condition might mean that the physiotherapist will need to decide if they undertake a general screening with detailed assessment of specific areas.
- The patient can have inflammatory and degenerative changes in the same region or joint, and possibly changes due to trauma. Clinical reasoning process needs to consider these

possibilities.

- The less experienced clinician is advised to consult more experienced colleagues, especially in the presence of a 'red flag'.
- Significant amounts of information can be gained from careful observation of active movement noting range, rhythm, ease of movement, painful arcs, 'trick movements' and inequalities of range between the different movements.
- Is it pain, weakness, joint stiffness or a mechanical block limiting movement and function? A judgement is needed about how much movement the patient can perform, based on the presentation of their condition.
- In the presence of an acute arthritis with widespread pain it might be inappropriate to do detailed tests of individual joint ranges. The assessment will require a functional orientation, e.g. general function, balance stability, walking ability and rising from lying and sitting. If a patient presents with acute arthritis then it is appropriate to liaise with the rheumatologist for information about the overall management plan.
- The time of day can affect the measurements obtained from those patients who have significant morning stiffness.
- Posture is a significant factor in inflammatory arthritis, e.g. ankylosing spondylitis (AS) and will influence the measurement of range of movement.
- A patient's perceptions, expectations and beliefs can have a very significant impact on what within physiotherapy is traditionally considered 'objective assessment'. Functional ability is a direct consequence of psychological processes and not just body biomechanics or physiology (Keefe and Somers 2010).
- Patients attend review assessments within rheumatology, therefore all measurements should be performed in a way which can be repeated at each review.
- Cardiac function may be tested by cardiologists and physiotherapists should be aware of the potential for cardiac and other systems to be involved in rheumatological conditions.

Axial skeleton

Active movements

- Cervical protraction and retraction can stress neck joints and should be used with caution if they need to be carried out.
- Curve reversal is an important point to note in the presence of spinal movements. With spinal stiffness in AS, a patient may display a good functional range of flexion whilst having a rigid lumbar spine, the movement being achieved entirely through motion at the hip joints.
- Cervical instability is a serious complication of rheumatoid arthritis and if suspected should be referred for a medical opinion. Physiotherapists should follow local policy and check red flags if planning to use manual techniques on the cervical spine in patients with inflammatory arthritis (Moffett and McLean 2006).

- In AS and the spondyloarthropathies the sternal, sternocostal, and costovertebral joints can all be involved, potentially affecting chest expansion. Measurement of chest expansion using a tape measure at xiphisternum level can be helpful to establish a baseline.
- Reduced rib joint flexibility causes reduction of respiratory efficiency and can reduce exercise tolerance. Selective testing of aerobic fitness can be useful in patients starting an aerobic exercise programme.
- In the majority of cases ankylosing spondylitis will begin in the sacroiliac joints and lumbar spine before the cervical spine. If AS is suspected in the lumbar spine then it is useful to undertake testing of the other vertebral regions because it might involve currently unaffected regions in the future.
- The Bath Ankylosing Spondylitis Metrology Index (BASMI) is a measurement tool (Table 15.2), which can provide an indication of the movement restrictions caused by AS and is used in the long-term review of the patient (Irons and Jeffries 2004).
- To determine the degree of limitation, add the 0, 1, 2 scores for each of the five measurements in Table 15.2 (the mean for cervical spine rotation counting as one score and similarly for tragus to wall and lumbar spine side flexion). This will provide a figure out of 10. This is the BASMI score. The higher the BASMI score the more severe the patient's limitation of movement due to their AS. An alternative scoring method can be found in Irons and Jeffries (2004).
- Most mechanical tests of the sacroiliac joints (SIJ) also put some stress on the hip or lumbar spine potentially making it hard to differentiate between these regions when more than one area has abnormalities. This is more likely to be the situation in older patients.

Table 15.2 Bath AS Metrology Index (BASMI), Jenkinson et al (1994)

	Mild 0	Moderate 1	Severe 2
C. Spine Rotation (mean of R&L)	>70°	20–70°	<20°
Tragus to wall (mean of R&L)	<15 cm	15–30 cm	>30 cm
Lumbar side flexion (mean of R&L)	>10 cm	5–10 cm	<5 cm
Lumbar flexion (modified Schobers)	>4 cm	2–4 cm	<2 cm
Intermalleolar distance	>100 cm	70–100 cm	<70 cm

Assessment of peripheral joints

- It can be challenging to select the tests which are most helpful in informing the assessment process, especially when degenerative changes can co-exist with inflammatory arthritis.
- The hands and feet are often among the first areas to be affected in inflammatory arthritis

and in undiagnosed cases who present with bilateral joint signs and symptoms this can be among the first indications of a developing condition (NICE 2009).

- The pattern of joint involvement will differ between rheumatoid arthritis, psoriatic arthritis and osteoarthritis; however, older patients may have pre-existing degenerative changes. These need to be differentiated from the development of problems associated with an inflammatory arthritis. In patients where the presentation is unclear then it might be useful for the patient to have appropriate diagnostic tests (e.g. plain X-rays, MRI scan or an ultrasound scan).
- A variety of methods exist for detailed measurement of finger joint movement. When measuring individual joint ranges it is important to keep sight of the overall purpose of the assessment. A collection of joint ranges in degrees is meaningless unless it relates both to function and the physiotherapy intervention process.
- It is helpful to consider the range of basic grips performed by the hand and wrist. Assessment needs to be directed at the loss of ability to perform these grips along with other subtle functional hand actions such as pressing and pushing.
- There needs to be effective multidisciplinary team working, for example with OTs, if there is potential for their involvement. A clear understanding of how core physiotherapy skills can help in the team management of patients is essential.
- The lower limb requires testing in non-weight bearing and standing.
- Balance tests can be informative, observing stepping up and down on a step, rising from sitting and (with appropriate patients) standing on one leg can all reveal muscle weakness, poor coordination and balance.
- Single leg standing whist flexing and extending the weight-bearing leg can also give an indication of fine muscle control and balance in that limb. Remember rheumatoid arthritis can cause significant toe joint deformities, which can have implications for balance.
- Biomechanical abnormalities can be helped by use of orthoses. Assessment for these is often provided by podiatry or orthotic services. The physiotherapist will need to liaise with the podiatrist or orthotist regarding the effectiveness of the orthotic.

Palpation

- Palpation in rheumatology is used to detect the presence of synovitis in peripheral joints, i.e. warmth, pain and swelling. It is a skill which develops with practice and palpation for temperature change can be performed with the back of the hand for added sensitivity. A high degree of skill is needed to interpret palpation findings.
- A rheumatology body chart is a useful tool for recording findings when assessing the hands or feet (Figure 15.2, page 234).
- Palpation of specific joints forms part of the DAS 28 assessment indicating severity of the disease process (Wells et al 2009).

Assessment format

The use of assessment proformas

- This is almost universal within the physiotherapy profession in clinical practice. These are a compromise between gathering all relevant information and working within the limited time available during an appointment.
- Printed assessment paperwork needs to be regarded as a tool to support assessment, they should not dictate the clinical reasoning process.
- This is especially important in rheumatology, which often involves conditions which are chronic and affecting multiple areas of the body.
- It is not possible to use a template that will meet the requirements of every rheumatological presentation. However there are tools available that can assist the physiotherapist in selecting information from the objective assessment, e.g. 'GALS' locomotor screening (Doherty et al 1992).

Example of upper limb rheumatology assessment formats

Standard format assessment headings

Name Date of birth Contact details
NHS/Hospital number
Social history:
Record symptoms (pain, paraesthesia, numbness) on standard body chart
24 hour pattern
General health, including red flags and drug history:
History of present condition:
Past medical history:
Upper limb objective assessment (lower limb form will be similar in format)
Observation:
Range of movement, recording range, quality of movement, limiting factors and symptoms during movement. A grid can be used to record the movements at each joint when carried out actively, passively and against resistance. Table 15.3 shows how this may be used for assessment of the hand. The same layout can be used for other areas such as the shoulder girdle or the hip.
Record additional notes, e.g. joint pattern, dactylitis, deformity.
Palpation: record findings on body chart.
Additional tests, e.g. neural assessment, neural dynamic testing

Special tests, e.g. joint integrity tests
Problem list
Treatment plan

Table 15.3 Recording assessment findings in the hand

5th digit	Active	Passive/accessory	Resisted
MCPJ			
PIPJ			
DIPJ			
4th digit	Active	Passive/accessory	Resisted
MCPJ			
PIPJ			
DIPJ			
3rd digit	Active	Passive/accessory	Resisted
MCPJ			
PIPJ			
DIPJ			
2nd digit	Active	Passive/accessory	Resisted
MCPJ			
PIPJ			
DIPJ			
Thumb	Active	Passive/accessory	Resisted
MCPJ			
IPJ			

Enthesitis monitoring

Where enthesitis is suspected then it may be useful to use a specific tool such as the Mander Enthesitis Index (MEI) (Mander et al 1987).

The following points are palpated and tenderness recorded:

- Iliac crest R and L
- Posterior superior iliac spine (psis) R and L
- Lumbar 5 spinous process
- Achilles insertion R and L
- 1st costochondral junction R and L
- 7th costochondral junction R and L
- Anterior superior iliac spine (asis) R and L

Tenderness on palpation of the points listed converts to a score with 0 (no points tender)

to 13 (all points tender). Refer to Appendix 15.1 for an example of the enthesitis index.

The assessment findings should provide evidence-based information about the patient and their associated problems that will enable an appropriate treatment plan to be devised and implemented that is specific to the needs of each patient.

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Chapter 15

E-materials

Author profiles

Mark Clemence Mphil GradDipPhys MCSP

Mark Clemence is a specialist physiotherapist working at Torbay Hospital, Devon.

Mark has had 24 years working within musculoskeletal physiotherapy, and in the last 10 has specialised in rheumatology and hydrotherapy. He has published extensively and previous publications include healthcare journalism, academic papers and reference material.

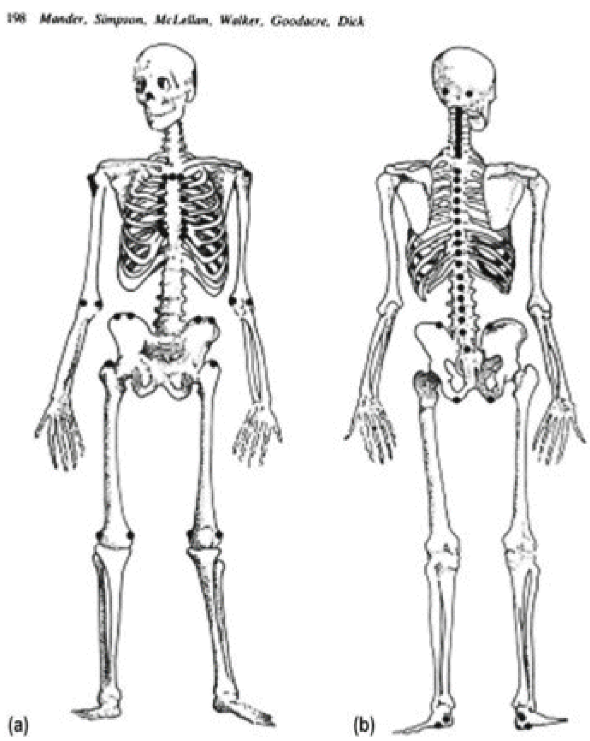
He regularly participates on the Chartered Society of Physiotherapy's members forum iCSP, for which he is a moderator.

Carole Fruin GradDipPhys Cert. Rheum. Practice MCSP

Carole is currently a specialist physiotherapist in rheumatology and has been involved in the treatment of rheumatology patients for several years. Carole has extensive experience of working in the UK and at the Specialist Rheumatology and Rehabilitation Hospital in New Zealand, at both clinical specialist and ESP level. Carole's special interest is in ankylosing spondylitis and she pays an active role in the running and promotion of the local NASS group.

Appendix 15.1 Entheses examined with patient lying (a) supine, (b) prone

From Mander, M., Simpson, J. M., McLellan, A., et al., 1987. Studies with an enthesis index as a method of clinical assessment in ankylosing spondylitis. Ann Rheum Dis 46, 197–202, with permission of BMJ Publishing Group Ltd.



Appendix 15.2 Useful resources and addresses

Arthritis Care/Young Arthritis Care

18 Stephenson Way, London NW1 2HD
Telephone: 020 7380 6500, Freephone 0808 800 4050

Arthritis Research UK

(Formerly Arthritis Research Campaign) Also provides information for patients and health professionals: http://arhtrisresearchuk.org
Copeman House, St Mary's Court, St Mary's Gate, Chesterfield, Derbyshire S41 7TQ
Telephone: 0870 850 5000

Astretch

A group of physiotherapists, from the UK, who steer the management and improve the understanding of ankylosing spondylitis.
They also provide training in both the assessment and treatment of ankylosing spondylitis. http://www.astretch.co.uk

EULAR

The European League Against Rheumatism: www.eular.org
Aims to promote, stimulate and support the research, prevention, treatment and rehabilitation of rheumatic diseases. Provides evidence to support treatment of a number of rheumatic conditions.

Lupus UK

St James House, Eastern Road, Romford, Essex RM1 3NH
Telephone: 01708 731251

National Ankylosing Spondylitis Society (NASS)

Provides a number of resources for both patients and health professionals to access, including information about assessment, specific exercises and stretches:
PO Box 179, Mayfield, East Sussex TN20 6ZL
Telephone: 01435 873527

http://www.nass.co.uk

National Osteoporosis Society

Camerton, Bath, BA2 0PJ
Telephone: 0845 130 3076; Helpline 0845 450 0230

National Rheumatoid Arthritis Society (NRAS)

Unit B4 Westacott Business Centre, Westacott Way, Littlewick Green, Maidenhead, Berkshire SL6 3RT
Telephone: 01628 823524, Helpline: 0845 458 3969

Case Study 15.1

Background

- SC was a 56-year-old woman who was recently referred to her local NHS Rheumatology department.
- She works as a waitress and was worried because of increasing pain in her hands which had been getting worse over 12 months and was causing her difficulty gripping plates and trays.
- In addition to hand pain she was also experiencing pain in her neck, both shoulders and both first toes.

Initial management

- SC initially consulted her GP, but was seen by a locum, who undertook a rheumatoid factor blood test.
- The results for this were negative, therefore the locum GP advised her that her problems were due to 'wear and tear'.
- She was prescribed non-steroidal anti-inflammatory (NSAID) medication.
- Because things were not improving she returned to see her own GP who made a referral to the local rheumatology department.
- During the time she was waiting for the appointment she experienced further deterioration in her symptoms with increasing stiffness and pain in her hands. This was becoming particularly bad in the mornings, making it difficult for her to dress, with

reducing shoulder flexibility causing problems reaching above her head.

Rheumatology referral

- When she attended her local hospital for a clinic appointment the rheumatologist asked questions that established in detail the nature and behaviour of her symptoms, her family history and her general health.
- Physical examination found her to have a slightly flexed posture and slightly protruding chin, otherwise spinal alignment was normal.
- Bilateral thickening was present over the 2nd and 3rd metacarpophalangeal (MCP) joints, which were tender when squeezed.
- Hand movement was normal, but she displayed reduced grip power.
- Wrists and elbows were normal.
- Bilaterally her shoulder flexion, abduction and internal rotation was slightly reduced.
- Neck movements were symmetrically reduced by about 20% in all directions.
- Hip, knee and ankle joints were normal.
- There was bilateral hallux valgus and stiffness of both first metatarsophalangeal (MTP) joints.
- On the basis of the history and examination the rheumatologist diagnosed seronegative rheumatoid arthritis, also diagnosing osteoarthritis of the first MTPJs.
- The rheumatologist said that he thought that the cervical spine problems were most likely due to degenerative changes.
- He explained that the results of the rheumatoid factor test may have been negative, but the test should not have been carried out in isolation to exclude the diagnosis of rheumatoid.
- SC was clearly showing signs of synovitis in her MCPJs and shoulders and to confirm the diagnosis a blood test for broad-spectrum inflammatory markers was needed.
- This was done along with X-rays of the hands, shoulders and cervical spine, to look for joint erosions and confirm the diagnosis in the cervical spine.
- The X-rays showed cervical degeneration, no changes in the shoulder joints and one small joint erosion of her right 2nd MCPJ.
- Results of the broad-spectrum test showed raised inflammatory markers.
- SC was prescribed a limited and reducing course of steroids to provide immediate symptom relief, and was prescribed the drug methotrexate, which can take up to 12 weeks to achieve therapeutic effect.
- She was referred to the rheumatology team physiotherapist and occupational therapist based in the hospital.
- In addition she was referred to the podiatrist at her GP's surgery for the foot pain.

Physiotherapy intervention

- The physiotherapist undertook an in-depth assessment of all main joint movements and in addition did a detailed assessment of the shoulders.
- The physiotherapist advised gentle range of movement exercises for the shoulders to maintain flexibility, advised the patient about posture correction and neck exercises.
- A follow-up appointment was given to check progress, exercises and provide additional advice.
- SC was reviewed again by the rheumatologist after 3 months and she was also seen again by the physiotherapist to review the progress made.
- There had been a significant improvement in the hands and shoulders, with SC finding it easier to dress and reported having fewer problems when carrying things at work.
- She remains on regular 6-monthly rheumatology clinic reviews and is also seen on an as-needs basis by the physiotherapist when she attends the hospital for these reviews.

Case Study 15.2

ES, female aged 50 years old.

HPC

- Back symptoms since the age of 15 years.
- Previously treated with traction and painkillers 20 years ago.
- Diagnosed with ankylosing spondylitis (AS) 9 years ago.
- Elizabeth was referred by a rheumatology consultant for physiotherapy.

Current problem

- Stiffness, lasting most of the day, mainly affecting her thoracic spine.
- Some thoracic spine pain, but stiffness more of a problem.
- Fatigue.
- Understanding of disease and disease process was limited and based on patient's own experience of symptoms.
- She has "got on with life" as she has had back symptoms for such a long time.
- Stiffness, when inactive, better when active.
- ES wakes approx 4:00 am with increased back stiffness and discomfort.
- No physiotherapy since being diagnosed with AS.

PMH

- Fractured ribs as a teenager after being kicked by a horse.
- No iritis, normal bowel functions, no skin problems, no depression.

- Bone mineral density: Hips: osteopenia −1.5, lumbar spine: normal (lower range) −0.7.
- Nil else of note.

Drug history

- Neurofen plus.
- Intolerant of most other anti-inflammatories.

Family history

- None of note.

Social history

- Owns a cattery, which is very busy. She wanted to keep working.
- Enjoys horse riding, but was unable to do this due to back pain and stiffness. This was something she wanted to do again.
- Swimming twice per week.

Assessment

- Weight: 68 kg.
- Height 168 cm.
- Protracted shoulders and chin.
- Chest expansion 2.5 cm.
- Tragus to wall: 13.0 cm.
- Lumbar flexion: 0.5 cm.
- Cervical rotation: 65°.
- Lumbar SF: 4.5 cm.
- Intermalleolar distance: 105 cm.
- No swollen or tender joints noted.
- Bath Ankylosing Spondylitis Measurement Index (BASMI) 4.2/10 indicating moderate–severe disease involvement.
- Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) 9/10 indicating severe disease activity.
- Bath Ankylosing Spondylitis Functional Index (BASFI) 7.5/10 indicating significant loss of function.
- Spinal pain in the last week 6/10.

Problems

- Thoracic spine stiffness.
- Thoracic spine pain.
- Fatigue.
- Limited knowledge of disease and management.
- Reduced function BASFI 7.5/10.
- Active disease ASDAI 9/10.

Patient goals

- Continue to work.
- Continue to go swimming.
- Start riding her horse again.

Medication

- ES was experiencing the active disease, it is appropriate to suggest that the patient is reviewed by the rheumatologist, so that their medication can be re-evaluated, in order to reduce the stiffness and pain.
- In the case of ES this had been done by the referring consultant.
- Reducing the disease activity will enable the patient to undertake regular exercise and activity.

Education

- Education about the disease and its self management was important for this patient.
- Support from other AS patients may also be helpful.
- ES was given details about NASS, contact with the local NASS group and informed where further information and support could be found.
- Advice about heat and the use of TENS was discussed.
- Pacing and rest/relaxation was addressed.
- Further discussion about function took place to aid the provision of suitable exercises, e.g. putting on socks was difficult, an exercise to help with hip and knee flexion was provided. Some patients may require assistive devices.
- The importance of regular daily exercise was explained and actively encouraged.

Exercise

- An individualised programme of exercise was provided for the patient. Exercises were

progressive and included warm-up exercises, strengthening, stretching and finishing with a cool down.

- ES was given strengthening exercises working the muscles against gravity.
- Stretching exercises were given, in particular for the thoracic spine.
- Pelvis, hips, shoulders and chest expansion exercises were also taught.
- Not all the exercises need to be done at the same time, they were planned to fit into the individual's daily routine.
- Posture and postural awareness was addressed.
- ES's daily activities in relation to her work were discussed and where possible movements and stretches were incorporated into her daily working routine.

Other treatment options

- As ES swims on a regular basis, hydrotherapy could be considered as an option.
- This may assist in developing exercises and stretching and may also help with pain management.
- Swimming should be encouraged, however, varying the swimming stroke can reduce the risk of stress and fatigue in joints.

Case Study 15.3

NG, male aged 24 years.

Background

- NG was diagnosed with rheumatoid arthritis aged 20 years.
- He did well on combined disease-modifying anti-rheumatic drugs (DMARD) therapy such as methotrexate, sulfasalazine and leflunomide.

Currently

- NG reports that his right elbow is the main problem, he feels it has been a problem on and off since the diagnosis of his disease.
- He feels it became worse following an operation for a tendon rupture in the right hand.

PMH

- 2005: ruptured extensor tendons right wrist, repaired.

Drug history

- Currently taking:
  - Naproxen
  - Methotrexate
  - Previously has had sulfasalazine (stopped this of his own accord)
  - No steroids or anticoagulants.

Social history

- Finished MSc, started a PhD.
- Currently trying to work for his PhD – using computer.
- Not much activity, likes socialising, has done swimming and walking in the past, would like to do some kind of activity.

Observations and examination

Right elbow

- Mild effusion noted no heat or redness seen.
- Flexion to 65°.
- Extension (cannot fully straighten elbow) fixed flexion of 55°.
- Therefore only has 10° of movement.
- Supination nil.
- Pronation 5°.

Left elbow

- Flexion full.
- Extension fixed flexion of 25°.
- Supination 15°.
- Pronation 20°.

Other joints of the upper limbs

Hands and wrists

- There was good function bilaterally.
- Some reduced movement of the thumb; however, there is good function.
- Full finger flexion bilaterally, full opposition and good power pinch and tri-pod grips were noted bilaterally.

Shoulders

- Function, difficulty getting hands to the back of his head and bottom of his back on the right.
- Can just about get hand to mouth on the right.
- There is reduced range of movement at both shoulders than would be expected for a male of this age.
- Movement loss is more marked on the right.

Patient reports that reaching up to get objects from high shelves/cupboards has become more difficult recently; reaching into his back pocket is also a problem. Patient is finding that function in the right arm generally is worsening, more recently over the last 3–4 months, during this time he has become generally less active than he has ever been.

Good muscle power to resisted muscle testing at the elbow and wrist; however, it was noted that resisted elbow flexion and extension on the right were painful and therefore, appeared weaker than on the left.

Pain could be the reason for the apparent weakness on the right.

Cervical spine was cleared, upper limb reflexes were intact.

Further testing, in the form of nerve conduction studies, did not indicate any problem with the nerves in the right arm; it is likely that the apparent weakness was due to pain rather than true muscle weakness. Distinguishing between painful joints and true muscle weakness can be a problem when assessing patients with painful, inflammatory disease and care should be taken.

X-ray right elbow and hands

- Elbow: joint effusion, advanced loss of joint space.
- Hands: erosive change is seen involving the wrist and intercarpal joints. There is moderate juxta-articular osteoporosis.

Main problems

- Reduced range of movement in the right elbow.
- Reduced range of movement and function in the right shoulder (probably rotator cuff involvement and possibly changes in the glenohumeral joint).
- Painful right elbow.
- NG feels that all aspects of his life are becoming more difficult, his social life, activities of daily living and studies are restricted.

Patient goals

- Reduce pain.

- Improve function in the right shoulder.
- Improve range of movement in the right elbow.
- Increase general activity/exercise.

The rheumatologist advised NG regarding his medication for pain control.

Physiotherapy treatment

The reduced range of movement at the right elbow and shoulder, which combined, were making it difficult for NG to use his right arm functionally.

Even if no further range could be gained at the elbow, the range of movement at the shoulder should be optimised in order to retain good function and treatment was based around this.

Range of movement exercises for the shoulder and elbow were advised along with progressive strengthening exercises for these joints.

Posture correction was also included and advice was given regarding posture while working/studying.

Pacing was discussed to enable NG to conserve energy for the activities he really enjoyed and did not want to miss out on.

NG was referred to the hydrotherapy pool to further aid with increasing range of movement and muscle power at the elbow and shoulder.

NG was advised about the use of heat to help with his pain control and general joint discomfort.

Despite tendon problems in the right hand, wrist and hand function were good, joint protection was discussed and referral to the occupational therapist was made and advice was given regarding suitable assistive devices to help with upper limb function.

The occupational therapist was also able to advise on computer adaptations and was able to provide NG with pen adaptations to ease pressure on the joints in NG's hands when writing.

NG was keen to return to some kind of regular exercise and was initially provided with some general strengthening exercises to start at home. NG was also advised about starting a progressive walking programme, which enabled him to attend the gym locally in Bristol.

Outcome

- Unfortunately NG's right elbow deteriorated rapidly and despite physiotherapy treatment, very little improvement in range of movement was obtained.
- However, the shoulder responded well to treatment and despite the reduction in elbow movement, the right shoulder now has good function.
- NG is likely to require an elbow replacement at some point, the range of movement has not deteriorated and pain appears to be under control.

• Hand function remains good.
• NG now exercises on a reasonably regular basis going to the gym and walking around town, he is managing his studies and social life well.

Chapter 15 Rheumatology multiple choice questions

1. Which of the following is not normally associated with rheumatoid arthritis?
   a). Synovitis
   b). Joint effusion
   c). Dactylitis
   d). Pain
2. In the majority of patients ankylosing spondylitis begins in the ...?
   a). Lumbar spine
   b). Thoracic spine
   c). Costochondral joints
   d). Sacroiliac joints
3. Which joint(s) are not normally affected by rheumatoid arthritis?
   a). Lumbar spine
   b). Cervical spine
   c). Shoulders
   d). Metacarpophalangeal
4. The definitive diagnostic test for rheumatoid arthritis is ...?
   a). Rheumatoid factor
   b). Plasma viscosity
   c). Erythrocyte sedimentation rate
   d). None of these is definitive on its own
5. NICE guidelines for inflammatory arthritis recommend
   a). Long-term treatment with oral steroids
   b). Early referral to secondary care in suspected cases
   c). Undertaking all investigations in primary care before referring to secondary care
   d). Early treatment with vitamin D
6. In the majority of patients EARLY ankylosing spondylitis is not normally associated with ...?
   a). Cervical syndesmophytes
   b). Morning stiffness
   c). Stiffness after sitting
   d). Buttock pain
7. The non-articular condition most commonly associated with ankylosing spondylitis is ...?
   a). Iritis
   b). Peripheral neuropathy
   c). Pulmonary hypertension
   d). Abdominal aortic aneurysm

8. Which of the following is considered a spondyloarthropathy?
    a). Rheumatoid arthritis
    b). Reactive arthritis
    c). Gout
    d). Osteoarthritis
9. Which of these members of the rheumatology multidisciplinary team is most likely to become involved in the treatment of ankylosing spondylitis?
    a). Rheumatology nurse
    b). Physiotherapist
    c). Podiatrist
    d). Occupational therapist
10. In current theory the onset of which of the following is not considered to be associated with an abnormality in the immune system?
    a). Rheumatoid arthritis
    b). Ankylosing spondylitis
    c). Osteoarthritis
    d). Reactive arthritis
11. In the hand which two types of arthritis will most commonly tend to affect the distal inter-phalangeal joints?
    a). Rheumatoid arthritis and osteoarthritis
    b). Rheumatoid arthritis and ankylosing spondylitis
    c). Psoriatic arthritis and osteoarthritis
    d). Psoriatic arthritis and rheumatoid arthritis
12. Which of the following types of drug is not NORMALLY used for long-term treatment of rheumatoid arthritis?
    a). NSAIDs
    b). Oral steroids
    c). DMARDs
    d). Anti-TNF agonists
13. Early psoriatic arthritis is not associated with ...?
    a). Ulnar deviation
    b). Dactylitis
    c). Sacroiliitis
    d). Plantar fasciitis
14. HLA B27 blood test will most commonly be used to confirm the diagnosis of ...?
    a). Rheumatoid arthritis
    b). Osteoarthritis
    c). Gout
    d). Ankylosing spondylitis
15. Which of the following statements should be considered false?
    a). Osteoarthritis and rheumatoid arthritis can simultaneously affect the cervical spine
    b). Osteoarthritis and ankylosing spondylitis can simultaneously affect the lumbar

spine

c). Osteoarthritis and ankylosing spondylitis can simultaneously affect the cervical spine

d). Rheumatoid arthritis and ankylosing spondylitis can simultaneously affect the cervical spine

16. The areas least likely to show early changes of rheumatoid arthritis on X ray are ...?
    a). Metacarpophalangeal joints
    b). Metatarsophalangeal joints
    c). Hip joints
    d). Wrist joints
17. What do the conditions ankylosing spondylitis, psoriatic arthritis, reactive arthritis and enteropathic arthritis have in common?
    a). They will always test HLA B27 positive on blood test
    b). They will always be associated with enthesitis
    c). They will always be associated with syndesmophyte formation
    d). None of the above
18. In the absence of an inflammatory arthritis, osteoarthritis is not normally associated with ...?
    a). Synovial proliferation
    b). Increased synovial fluid formation
    c). Articular cartilage reduction
    d). Osteophyte formation
19. The drug methotrexate is not thought to help ...?
    a). The proximal interphalangeal joints in rheumatoid arthritis
    b). The lumbar spine in ankylosing spondylitis
    c). The cervical spine in rheumatoid arthritis
    d). The metatarsophalangeal joints in rheumatoid arthritis
20. In modern rheumatology practice, which of the following areas affected by rheumatoid arthritis is least likely to be immobilised through regular use of splints or orthoses?
    a). Wrist
    b). Distal interphalangeal joints
    c). Cervical spine
    d). First metacarpophalangeal joints

Rheumatology multiple choice answers

1. c)
2. d)
3. a)
4. d)
5. b)
6. a)
7. a)

8. b)
9. b)
10. c)
11. c)
12. b)
13. a)
14. d)
15. d)
16. c)
17. d)
18. a)
19. b)
20. c)

Chapter 16

Spinal Cord Injuries

Acute spinal cord injuries

Introduction

- A spinal cord injury (SCI) is a traumatic event for both the patient and their family and it provides a multifactorial challenge to health care staff.
- It is fortunately a relatively rare presentation, with approximately 800–1000 new cases per year and an estimated 40 000 people living with an SCI in the UK (Kennedy 1998, Nichols et al 2005, Harrison 2007).
- When compared to other neurological disorders, such as a cerebrovascular accident (CVA) – 150 000 cases/year in the UK (Carroll et al 2001), the chances of a student or Band 5 physiotherapist encountering a SCI patient outside of a specialist centre is slim.
- However, it is this unfamiliarity with the presentation that can be particularly daunting to a physiotherapist of any grade.
- Most new cases of SCI first present to a district general hospital via accident and emergency.
- The National Service Framework for Long Term Conditions (Department of Health 2005) suggests a minimum standard of up to 24 hours of diagnosis and transfer within the first 48 hours; admission to a specialist centre is likely to be delayed by concerns around medical stability and bed availability (Harrison 2007).
- Patients with an established injury are also likely to be admitted to their local hospital during periods of acute deterioration or other periods of illness.
- Some patients with dual diagnoses, e.g. SCI and a traumatic brain injury may never reach an SCI centre.
- This can also be the case with some patients that have non-traumatic spinal cord impairments.
- As such, the initial management will invariably be provided by a therapist with a generalised experience or no previous experience of working with patients that have incurred a spinal cord injury.
- In addition to the management required during the acute phase, immediately post injury, the patient will require longer-term rehabilitation.
- If the patient has been managed in a SCI centre during the acute phase they will require their care to be transferred to a hospital/service closer to their home, for management of their progression or maintenance of their presentation.

- This may include physiotherapy rehabilitation.
- With the muscle imbalance and overuse characteristics inherent in SCI, complaints of a musculoskeletal nature are also common (Bromley 2006).
- Thus, a physiotherapist is likely to be required to manage the care of a SCI patient in a number of different circumstances at some time in their career, regardless of their background being respiratory, neurological or musculoskeletal.
- It is therefore in a therapist's interest to develop a basic understanding of the presentation and needs of this patient population, and more importantly, a knowledge of where to seek and access assistance in the sometimes complex and challenging care that these patients need to receive.
- Therapists encountering patients with SCI for the first time can feel concerned that they do not have the appropriate clinical skills or knowledge to effectively manage this patient group.
- However it is important to stress at this point that a therapist should not consider that they are managing a patient in isolation.
- Specific advice should always be sought from SCI centres to ensure the patient is being managed in the best possible way and this will ensure that the therapist develops their experience, expertise and confidence in an appropriate way.
- Most SCI centres aim to provide acute outreach teams, either in person and/or via phone to advise, educate and support peer professionals.
- This service has been shown to improve referral times and reduce the incidence or severity of preventable complications prior to a patient's transfer (Harrison 2001, 2007).
- It cannot be emphasised enough that the information included in this book does not propose to replace the specific individualised advice that can be obtained from contacting specialists in the field of SCI management based in the 11 SCI centres in the UK (Appendix 16.1).
- However, the assessment of a patient with a spinal cord injury follows a fundamental construct, using the skills of assessment that are common to all physiotherapists, and the information obtained will provide the basis of the patient's planned management.
- The aim of this text is to demonstrate to a therapist new to the field that they already have many skills to assess and manage this presentation and with some background knowledge and slight adjustment to the delivery, a competent and effective delivery of care is achievable for an otherwise challenging presentation.

General considerations during the assessment of acute SCI

- A spinal cord injury is considered to be one of the most devastating conditions that can occur following a trauma.
- In seconds an individual is catapulted from a familiar life as an able-bodied person into a previously unknown situation and an environment of, in most cases, permanent

disability.

Mechanism and demographics

- The most common mechanism for a traumatic SCI is a sudden impact or deceleration whereby the forces are transmitted through the spinal column. Velocity is not related to the existence of injury, but will affect the extent of injury if one is to occur (Ravichandran 1990).
- Road traffic accidents, falls and injuries from participating in sport are the most common causes of SCI.
- Incidence of SCI in the British Isles is outlined in Table 16.1.
- Up to 50% of injuries from a motor vehicle collision will also present with multi-trauma, including multiple level spinal injury, limb fracture, abdominal, chest, facial or head injury or significant soft tissue trauma (Prasad et al 1999).
- Non-traumatic causes, e.g. neoplasm, infarct, infection, have been estimated at being 20% of the total prevalence (Harrison 2007).
- In a 5-year prospective study of the Irish National Spinal Unit between 1999 and 2003, Lenehan et al (2009) reported 73% of admissions were male, with an average age of 32 years.
- The majority were injuries to the cervical spine (51%), followed by lumbar (28%) and thoracic (21%).
- One third had a complete spinal injury on admission.
- Previously, the condition was predominantly seen in young men, but as the population ages and remains more active, there has been a discernable increase in the number of older people with SCI (Nichols et al 2005).
- Paralysis most frequently occurs in traumatic SCI when instability and damage to the spinal column leads to disruption of the spinal cord.
- 'Severance' or 'cutting' of the spinal cord rarely occurs outside of stabbing or gunshot injuries.
- More commonly, compression of the spinal cord resulting in ischaemic necrosis and swelling, leads to the formation of the impairment (Harrison 2007).
- It is thus difficult to predict the finality of the impairment, as the oedema and spinal shock can progress or resolve over time, with subsequent changes in neurological impairment (Ravichandran 1990).

Table 16.1 Causes of SCI in the United Kingdom & Ireland (O'Connor and Murray 2006)

Cause of injury	Number of SCI centre admissions
Fall	24
Motor vehicle collision	23
Sport/recreation	4
Knocked over (e.g. falling object)	1

Other	1

Initial management

- The spinal cord injured patient will present with a wide range of impairments that may include all of the body systems.
- Patients with an acute SCI will need specific management to stabilise the injury site and maintain the function of the vital systems of the body to prevent complications from occurring.
- Upon arrival to A&E, assessment of the person with suspected spinal cord injury will commence immediately by the medical team.
- Once vital signs and life-threatening concerns are dealt with, the doctor will assess the injury, looking for obvious signs of spinal injury, such as spinal deformity and pain on palpation, loss or altered power or sensation and bladder and bowel disturbance (Harrison 2007).
- There will typically follow a request for a spinal X-ray, computed tomography (CT) and magnetic resonance imaging (MRI) of the affected area to determine stability of the fracture and the extent of spinal cord damage.
- Clinically, this will be paralleled with a test to determine neurological level and the degree of completeness.
- The American Spinal Injury Association (ASIA) developed a classification which has been adopted internationally, to assess and monitor the spinal cord injury (Figure 16.1).
- The motor assessment assesses 10 key muscles bilaterally (5 in the upper limb, 5 in the lower limb) whilst the sensory assessment assesses each dermatome bilaterally using standardised anatomical landmarks for light touch and pin prick sensation.
- Combined together this information determines the neurological level of injury, the completeness of injury and the syndrome (if an incomplete injury is diagnosed).
- The 'neurological level' is defined as 'the lowest segment where motor and sensory function is normal on both sides' (ASIA 2001) or in other words, the last level of normal neurological function.
- This does not always correspond to the level of vertebral injury.
- The higher the injury level, the greater the number of bodily functions that will be adversely affected.
- Patients with incomplete spinal cord injuries may experience more pain and muscle imbalance than a patient with a complete lesion at the same level.
- The neurological level may change over time as the swelling or bleeding within the spinal cord develops.
- Should the level ascend, it will be an important indicator of the potential progression of a disease or the onset of a complication.
- This can occur in both acutely injured and established patients.
- Thus subjective reporting and clinical monitoring are vitally important in identifying the frequency with which the assessment monitoring should be carried out.

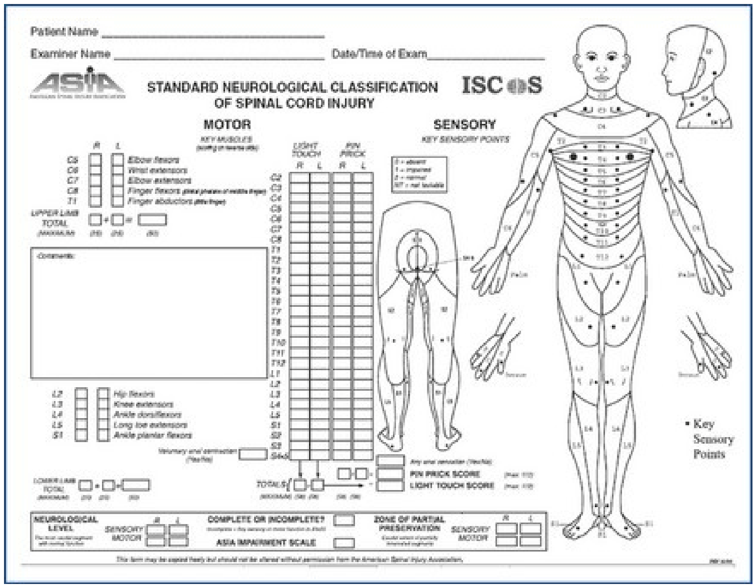


Figure 16.1 Standards for Neurological Classification of SCI Worksheet (Dermatomes Chart).

American Spinal Injury Association, 2011. International Standards for Neurological Classification of Spinal Cord Injury, revised April, 2011. American Spinal Injury Association, Chicago, IL. http://www.asia-spinalinjury.org/.

Definitions of complete and incomplete SCI

- Confusion often exists around the classification of complete versus incomplete injury.
- The ASIA Impairment Scale (AIS) provides a framework within which a categorisation can be provided.
- The scale is divided into five groups, A–E.
- Each of these is outlined on the reverse side of the standardised worksheet (Box 16.1).
- In the acute phase the exact extent of the completeness of the lesion may not be clearly defined due to the presence of swelling surrounding the spinal cord.

Box 16.1

Categorisation of SCI

A = Complete:

No motor or sensory function is preserved in the sacral segments S4 to S5

B = Incomplete:

Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4 to S5

C = Incomplete:

Motor function is preserved below the neurological level and more than half of the key muscles below the neurological level have a muscle grade less than 3

D = Incomplete:

Motor function is preserved below the neurological level and at least half the key muscles below the neurological level have a muscle grade of 3 or more

E = Normal:

Motor and sensory function are normal

Clinical syndromes

Central cord

Brown Sequard

Anterior cord

Conus medullaris

Cauda equina

American Spinal Injury Association: International Standards for Neurological Classification of Spinal Cord Injury, revised 2011: Atlanta, GA. Reprinted 2011.

Complete lesion

- AIS grade A
- This classification is given in the absence of S4/5 sensory and motor preservation.
- It is possible, nonetheless, to include 'zones of partial preservation'.

Zones of partial preservation

- Some people present with unilateral or bilateral function below the level of the injury site, without preservation of S4/5 function.
- These segments are described as 'zones of partial preservation' and can be either sensory and/or motor in function.

Incomplete lesion

- This includes AIS grades B–D.
- Sacral function at S4/5 must be preserved.
- The classification ASIA E is used for those who have normal motor function within the key muscles and normal sensory function.
- The motor and sensory scoring, however, may not be sensitive enough to identify the presence of spasticity or pain, subtle weakness, core instability or certain forms of dysaesthesia that could be a result of a spinal cord injury.
- Therefore those who are categorised AIS E may still require rehabilitation to address these issues.

Spinal shock

- Following a SCI, there will be a sudden and transient suppression of both somatomotor reflexes and autonomic function below the injury.
- This 'spinal areflexia' will result in flaccid paralysis of trunk and limbs and loss of vasomotor function with resultant hypotension.
- Urinary retention and constipation ensue due to bladder and bowel stasis (known as 'paralytic ileus') and male patients may experience sustained priapism (Nichols et al 2005).
- Perhaps the most worrying component for the physiotherapist is the loss of sympathetic outflow to the heart in injuries above T3, resulting in bradycardia or sinus arrest during turns, and suctioning. However, this is preventable.
- The period of spinal shock can last up to 6 weeks, but can be delayed by post injury complications (Benevento and Sipski 2002).
- Resolution of certain reflexes occurs at different rates, with Babinski's sign returning within the first day and bladder tone requiring up to 3 months (Ditunno et al 2004).

Autonomic dysreflexia

- This is a potentially fatal consequence of an injury above T6.
- It is the body's exaggerated reaction to a noxious stimulus below the neurological level, resulting in a rapid and extreme increase in blood pressure, which, if untreated, could cause cerebral haemorrhage.
- It manifests with a pounding headache, sweating and blotching of the skin above the lesion, pallor below the lesion, and bradycardia (Nichols et al 2005).
- The stimulus is usually a blocked catheter, constipation, sharp object, labour or passive movements.
- Treatment includes removing the stimulus, sitting the patient upright and using antihypertensive medication, e.g. nitrolingual spray.

Heterotrophic ossification

- Abnormal calcification at areas of small muscle tears is a suggested aetiology of this presentation, whereby bone is deposited around joints, especially the hip and knees.
- However the pathophysiology is still a matter for conjecture.
- The first signs are a 'spongy' end feel, with mild oedema and erythema.
- X-rays are normal for the first 2–3 weeks, then show 'cloudy patches' in affected areas (Bromley 2006).
- Ultrasonography is the preferred diagnostic tool in early stages and epidronate is the medication of choice.
- Passive movements are discontinued initially for approximately 1 week. Frequency,

repetition and force of passive movements are progressed cautiously over the ensuing 4–8 weeks (Bromley 2006).
- Surgery is only considered in cases of hindered function and/or sitting posture, however recurrence of ossification at the surgical site is common.

Syringomyelia

- This is a fluid-filled cavity within the spinal parenchyma which forms due to impaired CSF flow, predominantly due to mechanical encroachment, redirecting flow into the cord.
- It is evidenced by localised pain, tonal alteration and ascension of neurological level in established patients (Bromley 2006).
- Diagnosis is by MRI and management either involves monitoring or insertion of a surgical shunt.
- Effectiveness of either approach is highly variable and remains a topic for discussion.

Other complications

- The multisystem impairment involved in a spinal injury predisposes a patient to a wide variety of other complications.
- The most common include:
  - Recurrent urinary tract infections
  - Abdominal distension
  - Contracture
  - Postural deformation
  - Spasticity
  - Pain
  - Pressure sores
  - Cardiovascular compromise
  - Osteoporosis (Bromley 2006).
- The physiotherapist must be mindful of the potential or presence of these as it will alter the assessment and future preventative or curative management offered.

Planning and implementing the assessment of SCI

- The physiotherapist must draw on their knowledge of anatomy, physiology and the core areas of their training in cardiorespiratory, musculoskeletal and neurological assessment approaches when approaching the assessment of a patient with a SCI.

- Therapists new to the field may feel overwhelmed by the number of impairments affecting a patient and not know where to start.
- It is therefore important to use a problem list approach to organise the process of applying clinical reasoning and problem solving.
- This will ensure that no important components of the assessment or issues are accidentally missed.
- It is the practice at the National Spinal Injuries Centre (NSIC) at Stoke Mandeville to use a set format to guide the assessment and treatment planning, these will include the following:
  - Respiratory (always the first priority)
  - Range of motion/muscle length
  - Sensation
  - Muscle power
  - Tone
  - Pain
  - Skin
  - Residual function and abnormal patterns of movement
  - Psychology and cognition
  - Functional assessment
  - Cardiovascular fitness.
- The reader should recognise that they already have many skills from their core training and previous clinical experiences that they can utilise to address the areas identified in the list.
- These skills remain valid and with some modification can be used in the assessment of this patient population with its specific needs.
- A clinician with little experience of working with SCI patients will soon find that they are able to undertake a comprehensive and effective assessment and formulate a treatment plan for a patient with a complex presentation.
- The headings from the list will be covered later in the chapter to illustrate how the therapist may assess the specific needs of the SCI patient and how this information may be used to ensure that the treatment plan is 'spinal specific'.

Acute stage (bedrest) assessment

- Physiotherapy will commence as soon after the patient's admission as possible in conjunction with the plan for the chosen form of medical management.
- Either surgical or conservative management of a spinal fracture may be considered.
- This will determine the length of bedrest that is required following injury and can influence the sequence of rehabilitation, but should not dramatically change the outcome of rehabilitation.
- Whilst the spine is still considered 'unstable' a patient will be nursed in a supported bed

(Figure 16.2a, b).

- A turning bed is the treatment of choice to decrease carer load whilst ensuring spinal alignment and respiratory and skin integrity.
- The spine will be managed with either skull traction (Figure 16.3a), head blocks (Figure 16.3b), cervical collar or pillows for postural reduction of spinal misalignment.
- Regular assessment of the patient forms an integral part of the treatment by the physiotherapist.
- Frequent review, re-evaluation and setting of goals is necessary to ensure treatment is effective and that the patient is involved in their rehabilitation as far as is practically possible.
- This philosophy should be followed throughout every patient's rehabilitation.
- The physiotherapist needs to carry out their own assessment of the patient as soon as possible with the evaluation of respiratory function being the first priority.
- Muscle power should be assessed and recorded regularly, especially if the neurological level is changing.
- Any change must be reported to the medical staff immediately.
- Prior to approaching the patient, the therapist must first ascertain the mechanism and level of injury, as well as the planned management.
- It is important to be familiar with the presence of any associated injuries, especially if they will alter the assessment, e.g. a limb or rib fracture.
- The patient's doctor should be questioned about the anticoagulation status prior to any limb movements, to minimise the risk of dislodging a thrombus.
- With each precaution and contraindication considered, the therapist is ready to proceed with a structured assessment.

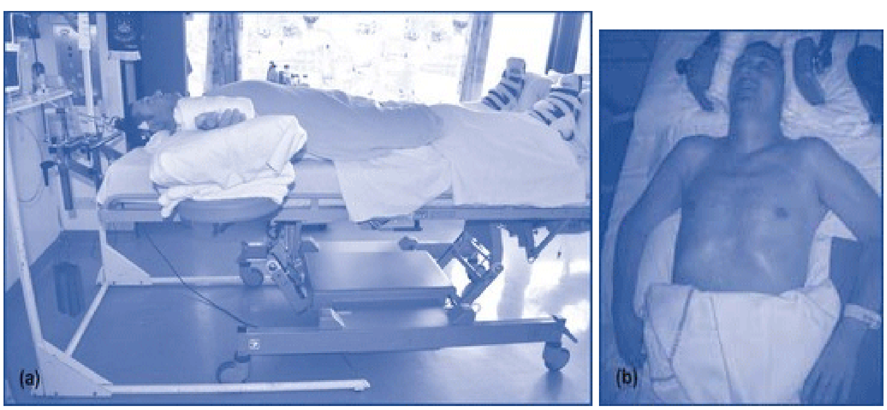


Figure 16.2 (a) Patient in support position in bed. (b) Supported position in bed.

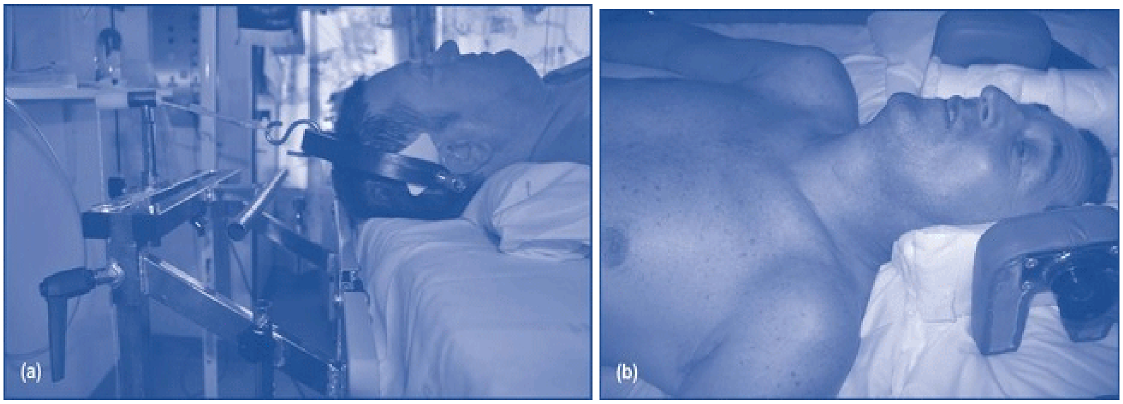


Figure 16.3 (a) Skull traction. (b) Headblock immobilisation.

Respiratory function

- The amount of chest physiotherapy required in the acute stage will depend on several factors:
  - Level of spinal lesion
  - Degree of completeness/incompleteness of spinal lesion
  - Any associated injuries, e.g. haemothorax, fractured ribs
  - Post injury complications, e.g. pneumonia, aspiration
  - Previous respiratory pathology, e.g. chronic obstructive airways disease, heavy smoking history.
- The associated mechanical inefficiency of breathing often results with a potential for fatigue.
- This may lead to the patient requiring either non-invasive or invasive mechanical ventilation.
- This risk is highest during the period of spinal shock (due to chest wall flaccidity), or post fixation (due to pain and general anaesthesia).
- It is common to observe a patient compensating well over the first few days post injury, followed by a rapid deterioration as fatigue ensues.
- Cohen et al (1982) demonstrated that an increase in respiratory rate was the first sign of respiratory fatigue, prior to seeing changes in vital capacity.

Assessment

- This will include general observation, auscultation, consulting chest X-rays, monitoring blood gas results and regular monitoring of vital capacity, which is imperative when paralysis of respiratory musculature is present. It should be noted that auscultation used in isolation can be misleading, as a low-volume inspiration may not allow the listener to hear all potential impairments.

- The inability of patients without innervation of abdominal muscles (typically T6 and above) to cough effectively will necessitate the use of forced expiratory techniques, such as assisted coughing. A therapist should thus routinely assess an independent cough, followed by noting the effectiveness of an assisted cough. The quality of sputum produced, if any, should also be noted.
- Palpation and identification of preserved respiratory muscle innervation is very important in the ultrahigh lesion as this will allow a therapist to predict a patient's potential to wean off ventilation or 'rescue breathe'.
- Any accompanying contraindications must be considered and appropriate modifications to assessment and eventual treatment must be made.

Range of motion

- Following spinal cord injury, disruption of descending control and input to spinal motor neurones leads to muscle paralysis and weakness.
- Immobility follows and where there is some preserved muscular innervation around a joint, muscle imbalance occurs.
- Secondary structural changes occur as a result of weakness, immobilisation (which can be imposed for management of the unstable spine), pain and disuse. This can include muscular, capsular and ligamentous shortening and changes in muscle stiffness.
- These structural changes subsequently impose further restrictions to movement, described by Gracies as the 'paresis–disuse–paresis' cycle (Gracies 2005).
- An assessment of the patient's baseline joint range of motion must be carried out at this stage and should be monitored on a regular basis, especially when changes are suspected.
- Even the smallest loss of range can significantly limit functional outcome, e.g. restricted elbow extension for a complete C6 tetraplegic will restrict their ability to transfer independently or shortened hip flexor muscles will prevent a paraplegic from ambulating with calipers, whilst shortened hip adductor and rotator muscles will limit the level of independence a person with spinal cord injury may achieve during activities of daily living such as lower body dressing.
- It must be remembered that restrictions to movement may be in place for the management of the unstable spine and therefore it may not be possible to fully assess the range of motion at every joint. Hip flexion is typically limited to 30° in unstable fractures at T10 and below, however full knee flexion range can be assessed by combining it with lateral rotation of the hip (i.e. the 'half tailor position') (Bromley 2006). Full shoulder range is essential for functional outcome, thus assessment should only be limited if it increases pain at the fracture site in an unstable cervical injury.

Sensation

- The ASIA neurological assessment completed on admission including light touch and pin prick sensation of each dermatome provides useful information for the therapist also and can be a prognostic indicator, e.g. preservation of pin prick has been linked to a likelihood of motor recovery (Srivastava 2005).
- Proprioception is tested and tactile discrimination, temperature and stereognosis can also be useful.

Muscle power

- The physiotherapist requires more in-depth information about muscle power than the 10 key muscles assessed by the medical team.
- Therefore a full muscle power assessment should be completed, in order to develop a treatment plan appropriate to the needs of the patient.
- The universal Oxford scale should be used and standardised as much as possible by the following means:
  - The patient must be able to complete the movement a minimum of three times through the full available range of motion in order to achieve the grade
  - If this is not possible, the lower grade should be given
  - Each muscle should be tested from the neutral position
  - Visualisation of the limb by the patient must be encouraged, if possible, in areas where proprioception is impaired
  - Assessment should commence with the grade 3 position and then be adjusted as necessary
  - \+ or – should not be used as this is highly subjective
  - Use of compensations (e.g. 'trick elbow extension') is common, but a therapist's handling can limit these, allowing a true picture of underlying muscle contraction.
- Whilst a patient is on bedrest and subject to movement restrictions, it may not always be possible to fully assess muscle power, i.e. assessment in a position against gravity may not be possible. In this instance common sense is required, but if there is any uncertainty, the lower grade is awarded.
- The initial assessment may need to be modified due to the fracture or associated injuries.
- The stability at the fracture site may be put in jeopardy should excessive force be used to complete the muscle power testing, therefore great care must be taken to avoid this.
- A number of other factors may influence the ability to test and the outcome therefore must be considered:
  - Movement limitations, presence of brace or collar
  - Pre-existing conditions
  - Pain
  - Fatigue
  - Hypertonia
  - Medication

– Psychological factors.

Tone assessment

- Hypertonia is a common consequence of spinal cord injury, especially those with incomplete SCI, grades B and C (Heckman 1994).
- During spinal shock, the limbs are flaccid.
- As reflex activity returns, the emergence of altered tone may become evident.
- This may occur earlier and more significantly in patients with an incomplete lesion. Spasticity tends to gradually increase over the first year post injury before it plateaus.
- The neurophysiology of hypertonia is complex and encompasses both neural and non-neural (atrophy, change in number of sarcomeres, changes in muscle fibre type, intrinsic stiffness, muscle receptors) components.
- The management of the neural components is primarily pharmacological, whilst the management of the non-neural factors is through therapy and positioning and it is these factors that are considered to be the major cause of disability.
- Spasticity can be elicited by many stimuli, with touch and stretch being the most common, but infection, illness, injury or an overdistended bladder or bowel can also give rise to spasticity.
- It is therefore important to try to establish the potential cause and contribution of neural and non-neural factors in eliciting spasticity to aid with the control and management of this problem.
- There are a multitude of measures that can be used to assess and document tone, the most widely used are the Modified Ashworth score and the Tardieu scale.
- The presence of hypertonia can impact significantly on function and information regarding functional restrictions imposed by hypertonia can provide a very useful assessment and monitoring tool.
- Careful handling of the affected parts of the body is required and can provide a wealth of information on its own.

Pain

- Pain is a common complication following spinal cord injury (SCI), which can limit participation in rehabilitation, ability to perform functional activities and can impact on the patient's quality of life.
- The location, intensity, time since onset of spinal cord injury, duration, cause and aggravating factors are highly variable.
- Kennedy et al (1998) found that 'pain at 6 weeks post injury is the strongest predictor of pain at one year post discharge.'
- There are a number of different types of pain commonly encountered following SCI.

- Siddall and Middleton (2006) classified pain into two distinct categories:
  - Neuropathic pain, which is initiated or caused by a primary injury or dysfunction of the nervous system
  - Nociceptive pain, which can be musculoskeletal or visceral in origin.
- Acute musculoskeletal pain arises from damage to anatomical structures and is often related to activity, position or muscle imbalance.
- Chronic musculoskeletal pain may occur with overuse or abnormal use of structures such as the arm or hand.
- Successful management is dependent upon early intervention and relies upon an accurate assessment and close monitoring of the pain. A body chart, like those used in musculoskeletal departments, is a simple and typical way to document this assessment.

Skin condition

- SCI patients are particularly vulnerable to deterioration of the skin due to their altered circulation, sensation, muscle tone and functional capacity.
- A therapist involved in seating provision or the initial teaching of transfers must monitor the effect these have on the skin to avoid breakdown or further impairment.
- Documenting site, size and grading of a sore is typically sufficient for a therapist.

Residual function and abnormal patterns of movement

- The levels of residual function will need to be determined during the acute stage, which will assist the physiotherapist to plan the treatment to encompass the remaining intact muscle groups.
- It is also important to note how abnormal patterns of movement interfere with the residual functional abilities of the patient and how easily these patterns can be modified.
- The early involvement of the patient in exercise and education can help prepare them as an individual to participate in the future goals of their rehabilitation.

Psychology and cognition

- The psychological impact of spinal cord injury can never be overestimated.
- The physiotherapist may become aware of changes in a patient's mood and it is important that this is brought to the attention of the team members with specific skills in psychological assessment and management.
- The ability of the patient to engage with instructions will also have a bearing on their ability to achieve the high levels of independent function required during their

rehabilitation. Impaired cognition may have been a causative factor in the spinal injury, or may have developed as a result (e.g. head injury or medication).

Assessment for early rehabilitation

- The patient is allowed to mobilise once the spinal fracture is stable or they are deemed medically stable.
- Support for a fracture may be required in the form of a collar or spinal corset, which will be advised by the medical team.
- Appropriate cushioning and wheelchair mobility will need to be provided.
- Following mobilisation re-examination needs to be carried out.
- Due to the removal of many of the limitations that are imposed during the bed rest phase, e.g. positioning and factors to protect the unstable spine, there may be changes in the assessment findings.
- There may be changes in range of movement, muscle power, tone and pain. Improvements in strength could be due to neurological development or improved pain/cooperation, whilst an apparent deterioration could be due to the tester's ability to grade each muscle in the correct position.
- There may also be an organic cause and the reason for any deterioration must be documented and communicated to the appropriate medical staff.
- The patient's core control can be assessed once they are sitting up out of bed.
- It is at this stage that the rehabilitation potential is often defined.
- Physiotherapy assessment will re-evaluate the tests carried out in the initial assessment, identifying any complications and also the potential for functional development. Typically, this is performed once the patient can sit for longer than 4 hours, to counteract any effect fatigue may contribute.

Functional assessment

- A functional assessment must take place for those commencing rehabilitation, those undertaking advanced rehabilitation or for those who require a further period of rehabilitation following a complication, illness or change in neurological status.
- The findings can be used to formulate a treatment plan, set appropriate goals, evaluate the efficacy of intervention and to engage and motivate the patient and family in the rehabilitation process.
- Functional assessment should form an integral part of rehabilitation and be completed on a regular basis.
- An understanding of the functional potential for each spinal level and an awareness of the potential complications and limitations is required to tailor the functional assessment and formulate the treatment plan. This is outlined in Appendix 16.3. The current ability and predicted level of independence of each of the following areas must be assessed and

evaluated, documented and used to develop a treatment plan. Any limiting or interfering factors need to be assessed and minimised as part of the treatment plan.

Wheelchair mobility

- The patient must be assessed for their ability to negotiate slopes, kerbs and uneven surfaces in addition to pushing on level surfaces including carpets etc.
- The technique of propulsion is also important to assess to identify poor technique which may lead to shoulder and upper limb pain and injury in the future.

Gait assessment

- The assessment of gait following spinal cord injury falls into 2 categories:
  - Patients with lower limb paralysis requiring orthoses to ambulate
  - Patients with an incomplete spinal cord injury resulting in varying degrees of partial paralysis of the lower limb, who may also require orthoses.
- It is essential to be able to analyse the gait pattern of both the categories above to prevent injury, ensure efficiency and maximise function.
- It is also important to appreciate the role that extensor hypertonus may play in enabling some patients to walk. Whilst it is important to facilitate a normal pattern of extensor activity, over inhibition of the hypertonus may prevent the patient from mobilising.
- Knowledge of a normal gait pattern is crucial to be able to identify an abnormal gait pattern and numerous texts are available to provide this information. For further information regarding gait assessment for those with lower limb paralysis please consult (Bromley, 2006; Harvey, 2008).

Potential for involvement in sport and work

During the rehabilitation process the patient may identify a wish to participate in sports and also the possibility of returning to work.

Balance

- Balance forms an integral part of most activities, either in or out of the wheelchair.
- Balance in long sitting is required for many activities on the bed such as dressing, moving around the bed and moving from lying to sitting.
- Long sitting can also be used as a means of transferring, whilst balance in short sitting is often used for activities in the wheelchair, transfers, toileting, showering and dressing.
- The ability to maintain balance in long and short sitting as well as during a functional task must be assessed.

- The ability to maintain balance in the wheelchair during wheeled movement is a key component of the activities of daily living.
- Assessment must consider potential for independent propulsion, wheelchair management and the most appropriate seating system.

Matwork

- Rolling, lying to and from sitting and moving around the bed form many of the components required for functional activities, e.g. dressing, turning in bed, getting in and out of bed and positioning pillows.
- The ability to complete the tasks and each individual component forms part of the overall assessment and can be used to indicate the level of care that may be required on discharge.

Pressure relief and skin management

- A patient must become independent in being able to check their skin to ensure that it remains healthy and free from damage that could lead to infection and a return to bedrest.
- A patient's ability to visualise pressure areas with a mirror should be assessed as well as their independence in relieving pressure whilst in the wheelchair. Where physical independence is not achievable, verbal independence should be assessed instead.

Transfers

- Prior to assessing any transfer a risk assessment must be undertaken to ensure safety for both the patient and the physiotherapist.
- Position of the wheelchair and sliding board (if used), alignment of the castors, starting and finishing position, hand position and body position during the transfer will have a significant effect on the ability to complete level transfers such as wheelchair to bed, split-level transfers and advanced transfers such as bath, toilet, car, floor and sofa.
- Therefore not only must the level of independence be assessed, but each of the component parts to ensure safe completion of the task and to prolong the ability to complete the task and avoid injury.

Cardiovascular fitness

- Poor cardiovascular fitness is a leading cause of death post SCI. Cardus et al (1992) reported it was responsible for 50% of deaths.
- It also prevents patients performing many of the motor tasks that are required of them on

a day-to-day basis (Harvey 2008).

- Stewart et al (2000) investigated a number of different objective assessments of fitness in the spinal population. Power output and VO_2 at maximal workload, and ratings of perceived exertion at a standard workload demonstrated stability and sensitivity to therapeutic change, much more so than HR or other ventilatory measures such as vital capacity. It should thus be considered that using the Borg Scale of Perceived Exertion is likely to be the most accurate and easy-to-use measure in the clinical context.

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Chapter 16

E-materials

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Author profiles

Scott Hawthorne

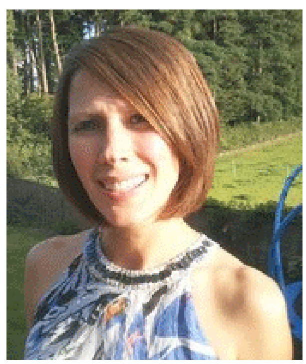
Scott graduated from Sydney University at the end of 1998, believing sports physiotherapy was the only area of interest. However, following exposure to acute spinal cord injuries as a new graduate at Royal North Shore Hospital in Sydney, he chose to continue in this field as a rehabilitation physiotherapist at Moorong Spinal Unit, Royal Rehabilitation Centre Sydney from the year 2000. Under the guidance of Lisa Harvey, a highly published PhD in the field of spinal injuries, he established a firm knowledge base in the speciality.

As is common with many an Australian physiotherapist, the lure of travel brought him to the UK in 2002 and exposed him to a variety of fields as a locum physiotherapist. He eventually returned to his earlier acute practice in 2004 at North Middlesex Hospital for 2 years as the physiotherapy lead in acute medicine for the older person.

His long-held desire to work at the National Spinal Injuries Unit at Stoke Mandeville Hospital came to fruition in 2004, whereby he has since continued to work as a specialist physiotherapist in acute spinal cord injuries. He developed a passion for teaching, and has been the principal lecturer for the acute component of the spinal injury course 'Bridging the Gap' and yearly presents as a 'visiting lecturer' at the University of Bedfordshire, School of Nursing.

Joanna Camp BSc(Hons) MCSP

Jo has specialised in Neurological Physiotherapy for 13 years, and has been working at the National Spinal Injuries Centre, Stoke Mandeville as a Highly Specialist Physiotherapist since 2001. A keen educator, she currently runs a 'Splinting in Neurology' course and lectures on Physiotherapy management of adults with spinal cord injury. She has a specialist interest in the rehabilitation of persons with incomplete Spinal Cord Injury.



Appendix 16.1 Spinal cord injury centres in the united kingdom and eire

Belfast Spinal Cord Injuries Unit

Musgrave Park Hospital
Stockman's Lane
Balmoral, Belfast BT9 7JB
Tel: 028 9066 9501

The International Spinal Injuries & Rehabilitation Centre

Royal Buckinghamshire Hospital
Buckingham Road, Aylesbury
HP19 3AB
Tel: 01296 330 575

National Medical Rehabilitation Centre

Rochestown Avenue, Dun Laoghaire
Dublin
Eire SB 30
Tel: 00-353-12854-777

Queen Elizabeth Spinal Injuries Unit

Southern General Hospital
1345 Govan Road, Glasgow
G51 4TF
Tel: 0141 201255

Golden Jubilee Spinal Injuries Centre

James Cook University Hospital
Marton Road, Middlesbrough
TS4 3BW
Tel: 01642 85085

The Midland Centre for Spinal Injuries

The Robert Jones & Agnes Hunt Orthopaedic Hospital
Oswestry, Shropshire
SY10 7AG
Tel: 01691 404655

Rookwood Spinal Injuries Rehabilitation

Unit

Rookwood Hospital
Fairwater Road, Llandaff
Cardiff
CF5 2YN
Tel: 029 2041 5415

The Duke of Cornwall Spinal Treatment Centre

Salisbury District Hospital
Odstock Road, Salisbury
SP2 8BJ
Tel: 01722 336 262

Princess Royal Spinal Injuries Unit

Northern General Hospital
Osborne Building, Herries Road
Sheffield
S5 7AU
Tel: 0114 2715644

Southport Regional Spinal Injuries Centre

Southport and Formby General Hospital
Town Lane, Southport
PR8 6NJ
Tel: 01704 547471

The London Spinal Injuries Unit

Royal National Orthopaedic Hospital
Brockley Hill, Stanmore
HA7 4LP
Tel: 020 8954 2300

National Spinal Injuries Centre

Stoke Mandeville Hospital
Mandeville Road, Aylesbury
HP21 8AL
Tel: 01296 315 000

Yorkshire Regional Spinal Unit

Pinderfields General Hospital
Aberford Road, Wakefield
WF1 4DG
Tel: 01924 201 688

Appendix 16.2 Spinal innervation of the muscles of respiration

Muscle(s)	**Innervation**
Platysma	7th cranial nerve (facial)
Sternocleidomastoid	11th cranial nerve (accessory)
Trapezii	11th cranial nerve (accessory)
Diaphragm	C3–5
Scalenes	C3–8
Pectorals	C5–T1
Intercostals	T1–11
Abdominals	T6–12

Appendix 16.3 Resources

Segmental level	Personal independence	Wheelchair management	Transfers	Gait
C4	Type, turn pages, use telephone and computer with mouthstick			
C5	Type Feed	Manipulate brake Push on the flat		
C6	Drink Wash, shave, brush hair Dress upper half Sit up/lie down in bed Write	Remove armrests/ footplates Push on sloping ground Turn chair	Chair ↔ bed Chair ↔ car ?with sliding board	
C7	Turn in bed Dress lower half Skin care	Pick up objects from floor Wheel over uneven ground 'Bounce' over small elevations	Chair ↔ toilet Chair ↔ chair ?Chair ↔ bath	Stand in frame

C8	Bladder and bowel care	Negotiate kerbs	Chair ↔ bath	Stand in frame
T1–T5		Balance on rear wheels Pull wheelchair into car	Chair ↔ floor	Stand in frame Swing-to in bars
T6–T9			Chair ↔ crutches	Swing-to on crutches or rollator ?Stairs
T10–L1				All three gaits on crutches Stairs Car ↔ crutches Floor ↔ crutches

Appendix 16.4 Resources in the public domain

- http://www.physiotherapyexercises.com

Free spinal injury exercises, for producing guidance sheets for patients, similar to 'PhysioTools'. Also shows video footage of a number of functional tasks performed by wheelchair users, e.g. floor to chair transfer

- http://www.pva.org/site/PageServer?pagename=pubs_main

Thoroughly researched and referenced guidelines to clinical practice for clinicians of all levels of experience in spinal injury. Consumer manuals for patients and family are also available for free download

- http://www.scireproject.com

The spinal injury version of the 'Cochrane Collaboration' producing systematic reviews covering many aspects of spinal injury care

- http://www.spinalcord.uab.edu

A spinal injury information network, listing a number of topics, linking the user to external related educational websites

- http://www.spinalcordcenter.org/consumer/manual.html

Educational manuals aimed at patients and their families covering a wide range of spinal injury topics. Also useful to therapy students new to the field

Case Study 16.1 Cervical C4 complete spinal cord injury (AIS A)

- 21-year-old male, labourer.
- RTA, the car he was a passenger in, hit a wall and rolled at 60 mph.
  - Complex fracture and anterior dislocation of C4.
  - Pedicle and lamina fractures of L2 and L3.

Initial assessment

- On admission to the SIU the following observations were recorded:
  - vital capacity was 1.16 litres
  - oxygen saturations were 94% with the patient self ventilating on room air, increasing to 97% when using the incentive spirometer
  - cough was very weak and dry, whether supported or not
  - auscultation was quiet throughout
  - initial CXR and ABGs were normal
  - there was full upper limb range (shoulder extension not tested due to turning bed) and no limitations were seen in the lower limbs within the allowable 30 degrees hip flexion (due to unstable L2/3 fractures)
  - no power or sensation seen below C4
  - all four limbs were flaccid
  - the patient complained of sharp pain in the neck 9/10 over C4.

Acute/bedrest management and early rehabilitation

- On Day 1, IPPB was refused, so incentive spirometry was commenced instead, with reluctant compliance.
- Full passive upper limb ranging was performed, as was the case with lower limbs, limiting hip flexion to 30 degrees and using ‘frogging (half tailor position)’ to achieve full knee flexion range.
- The therapist liaised with the medical team regarding analgesia for neck pain and a positioning programme commenced for the upper limbs, using the ‘half crucifix’ position with the assistance of arm boards on one side and distal elevation of the contralateral upper limb by the patient’s side using a ‘ski-jump’ pillow.
- Occupational therapists assessed the patient for resting hand splints.
- NIV BiPAP via a facemask was commenced at the first sign of respiratory distress and elevated $PaCO_2$.

- As cognitive function started to improve, habitual posturing of the shoulders in elevation was noticed, resulting in pain on passive shoulder flexion at 160° and palpation of bilateral upper trapezius muscles 8/10.
- The patient required intubation, due to minimal spontaneous respiratory effort. Chest physiotherapy included side to side turning using the turning bed mechanics, manual hyperinflation (MHI) with periodic inspiratory holds, adding bagged in nebulised mucolytics (e.g. Parvolex™) as secretions became thicker, expiratory shakes and closed circuit suction performed in time with manual assisted coughs.
- Regular assessment for respiratory activation was performed throughout whilst the patient was on the manual hyperinflation bag or IPPB.
- Upon return of function, vital capacity was recorded via the tracheostomy (Wright™ respirometer Mark 8) at 50 mL.
- As the routine became established, IPPB delivered via the tracheostomy replaced MHI to free up the therapist's hands and to allow for spontaneous breath attempts.
- Positioning of the limbs and passive ranging continued as it had on the ward.
- When episodes of asystole began to present, each therapy session was preceded by prophylactic IV glycopyrrolate and 100% oxygen delivered through the ventilator 2 minutes prior to commencing treatment.
- A nurse was on standby with atropine should the heart rate drop and remain below 40 beats per minute.
- This ceased once the pericardial effusion was drained and no further bradycardic episodes were observed.
- Full range lower limb stretching was performed post lumbar surgery, including hip flexor stretches whilst the patient was turned to the side for washing.
- Neck stretches and active assisted neck range of motion exercises commenced post removal of the collar after the consultant's permission was obtained.
- The Cough Assist™ machine was introduced upon returning to the ward and delivered by the nursing staff via the tracheostomy, twice daily post bronchodilator nebuliser to encourage regular secretion clearance.
- The father was taught this, along with tracheal suctioning by the senior physiotherapist, to maintain secretion clearance and also to assist the father's parental desire to help his son in a practical fashion.
- Distal limb joint ranging was also taught to the father for this reason.
- Soft tissue massage of upper trapezius muscles, caudal and lateral scapulae glides and regular repositioning of the shoulders into depression was used to assist with shoulder pain.
- Heat and acupuncture were considered, but avoided due to inability of the patient to monitor response to the intervention.
- Following the report of loss of dorsiflexion range, bilateral UFOs (Universal Foot Orthoses) were utilised, slowly increasing the time period of application to monitor effects on the skin.
- Customised soft/scotch casts were avoided due to the varying limb circumference evident

post spinal injury.

- As spontaneous respiratory efforts recommenced, IPPB was utilised with a gradual increase of the trigger (lower sensitivity) as improvements occurred.
- This functioned as 'biofeedback' for a neurological system undergoing plasticity.
- Progression came with the use of a low vital capacity incentive spirometer (e.g. Cliniflo™) via the tracheostomy with entrained supplemental oxygen.
- Upon permission to mobilise out of bed, preparations were made by sourcing a suitable tilt-in-space wheelchair and cushion and sitting up in bed with an abdominal binder in situ using the inbuilt bed mechanics.
- The father was taught the bed controls and together they progressed subjective tolerance of the upright position in bed.

Re-assessment post-mobilisation

- A repeat formalised neurological check identified a new diagnosis of C2 AIS A tetraplegia with a zone of partial preservation between C3–4.
- Repeat muscle chart showed bilateral grade 4 shoulder elevation and grade 2 scapulae retraction. All other muscles were absent. Sensation was normal to the C2 key point, impaired to C4 and absent below.
- Shoulders achieved full range flexion, but with pain above 160 degrees. Ankle dorsiflexion was limited to 10° past plantargrade. Pain at 6/10 remained on palpation of upper trapezius muscles. Moderate cervical dystonia was evident, restricting all ranges to half of predicted. The trunk also had minimal range throughout. Upper limb extensor tone was graded as '2' on the Modified Ashworth Scale.
- Vital capacity remained at 50 mL, CXR and auscultation was clear and a moderate dry cough was generated with assistance. He remained on volume control ventilation via cuffless tracheostomy and achieved half a second of disc elevation during incentive spirometry set at a resistance of 100 mL/s.
- A repeat cervical MRI showed myelomalacia between C3–5.
- In addition to the initial assessment the following points were identified during the early rehabilitation process:
  - Pressure mapping during seating clinic showed even distribution of pressure whilst on a Roho cushion only
  - Neuropsychology assessment demonstrated reduced executive function, behavioural/disinhibition issues and an improving short-term memory
  - An occupational therapy access visit concluded his current residence was inaccessible and unable to be modified. Recommendations were made
  - Dependent on assistance for all mobility and activities of daily living.

Management post-mobilisation

- IPPB use decreased, replaced by increased frequency of incentive spirometry use and a formal weaning programme.
- The long-term goal was to wean completely off ventilator use both day and night.
- Use of the Trainair™ began for enhancing respiratory muscle control.
- Prophylactic Cough Assist use continued twice daily throughout the remainder of his stay, delivered by nurses first, then carers.
- Joint and muscle length management involved regular passive limb and neck stretching, Maitland's mobilisation techniques for both the glenohumeral and scapulothoracic joints, trigger point needling of the upper trapezius muscles (as cognition improved) and trunk stretches over a roll during plinth work.
- He used a passive leg bike regularly and stood with the assistance of a tilt table every other day.
- A thoracic corset was manufactured by the Orthotics department to assist trunk alignment in sitting, but compliance was poor throughout and the approach was discontinued.
- A 24-hour positioning programme was established in collaboration with Occupational Therapy and nursing for both seated and recumbent postures – pictures with simple instructions were placed above his bed (with his permission) and in the medical notes to enhance continuity between changes in nursing shifts.
- Eventually the patient became verbally independent in instructing appropriate alignment.
- Strengthening of the available upper limb muscles was facilitated using sling suspension, with as much focus on 'active relaxation' as on contraction.
- Functional electrical stimulation (FES) was trialled on a variety of other upper limb muscles with no effect.
- Neck strengthening involved both power (springs as resistance whilst supine under a gantry) and endurance (tolerance of mouth stick activities) training.
- Regular active neck ranging outside of gym sessions was encouraged.
- Aquatic Physiotherapy was utilised twice weekly for a period, to assist limb and trunk mobility as well as to provide another medium for the patient to attempt to activate muscles he was unable to before. This last component did not assist in his case.
- Seating assessment and trials of a variety of chairs, cushions and backrests occurred with the assistance of pressure mapping.
- Recommendations to his local wheelchair service were forwarded and final set up occurred upon delivery.
- He was taught to be verbally independent in instructing wheelchair set up prior to transfer, alignment post transfer and requesting assistance with pressure relief hourly to prevent skin deterioration.
- Goal planning commenced with the multidisciplinary team, initially focusing on short-term goals with the assistance of his father, progressing to discharge planning with decision making resting more with the patient.
- Multidisciplinary involvement included:

- Medical staff titrating analgesia and antispasmodics
- Nursing teaching verbal independence in bladder, bowel and skin management. Education was given to assist the return to sexual activity
- Occupational therapists assisting access to computers via voice control, mouth-stick functional activities, independent mobility via a chin-controlled powered wheelchair and encouraging verbal independence in washing, dressing and domestic activities. They conducted community reintegration visits into the local town centre
- Speech and language therapy working to enhance his ongoing dysarthria. Swallowing was not an issue
- Psychology continued to focus on cognitive, behavioural and emotional issues. Counselling was provided to his father and regular liaison occurred with the treating team to enhance outcome during sessions without being hindered by challenging behaviour
- Case management assisting provision of a discharge destination and a care package.

- Upon identification of named carers for his discharge destination, each member of the team conducted teaching sessions and provided individualised literature to support maintenance and progression of rehabilitation goals.
- Physiotherapy teaching focussed on respiratory and limb maintenance and direct liaison with the local physiotherapist who would be taking over his management post discharge.

Outcome

- Formal neurological testing at discharge resulted in a classification of C3/4 AIS A.
- Discharged to a neurological care home close to his family with in-house physiotherapy. This was to be an interim whilst awaiting re-housing options from his local authority.
- Verbally independent in all activities of daily living, personal care and transfers.
- Self ventilating 24 hours/day with a vital capacity of 1500 mL. The tracheostomy remained for suction access, with a 'red dot' in situ during waking hours.
- His own Cough Assist machine was provided, and continued to be used twice daily under his guidance.
- Daily maintenance stretches were provided by carers, with nocturnal use of hand splints.
- Negligible pain and joint range loss was evident at discharge. He continued to use the tilt table twice weekly in the attached physiotherapy gym.
- He was independently mobile in his own chin-controlled wheelchair, with a manual tilt-in-space wheelchair provided as 'back up'.
- He was independent and regular in his use of the computer both by voice and mouth-stick control.
- He developed an interest in painting via a mouth-stick and joined the local branch of the Mouth and Foot Painting Artists.
- He had regular supervised outings into his local neighbourhood, with his favourite being monthly outings to motocross events with his father.

- He was yet to express an interest in returning to work, but relevant literature and information about agencies that help were provided.

Summary statement

- This case reveals the need for a physiotherapist to demonstrate a wide range of their therapeutic skills.
- It also shows that even in a specialist institution, management is not always optimum (e.g. use of temporary pacing or loss of dorsiflexion range as therapists were more focussed on respiratory care).
- It shows how quickly a patient can deteriorate and how volatile their body systems are thereafter.
- However, it also shows the potential to recover and that an acceptable outcome can be reached in an otherwise undesirable presentation.
- From Day 2, ABGs showed a $PaCO_2$ of 7.2 kPa prior to commencing BiPAP.
- CXR showed bibasal collapse secondary to poor inflation.
- Over the coming weeks, vital capacity dropped to zero, $PaCO_2$ remained around 7.2 kPa despite invasive ventilation, temperature remained high at 39.7°C, CXR showed left-sided lung collapse.
- Copious thick dark yellow secretions were sent for analysis and grew *Staphylococcus aureus*.
- From the third month, the CXR became clear, ABGs remained within normal levels and secretions became less copious and thick. Limited right hip flexion to 110° with a spongy end feel was attributed to heterotrophic ossification and it was noticed ankle dorsiflexion was limited to plantargrade.

Case Study 16.2 C4 Complete spinal cord injury (AIS A)

Background

- 21-year-old male, labourer.
- Previously fit and healthy.
- Weekend drinker, smokes 10 cigarettes per day since age 14. Periodic cannabis use.
- Lives with father and 3 younger brothers.
- Past medical history – hay fever; previously attended anger management classes.

History of spinal cord injury

Day 1

- RTA, car hit a wall and rolled at 60 mph.
- Initial loss of consciousness for 1 minute.
- Upon waking he complained of neck pain and unable to feel or move any limbs.
- Admitted to local hospital.
- Plain film X-rays showed
  - Complex fracture and anterior dislocation of C4
  - Pedicle and lamina fractures of L2 & L3.
- Managed with hard collar and analgesia.

Day 2

- Transferred to Spinal Injuries Unit (SIU), treated by cervical traction and head blocks, on a turning bed.
- He developed Type II respiratory failure and was placed on NIV BiPAP via a facemask.
- He became agitated and sedation was increased to protect the spine.

Day 3

- Surgery, C4 posterior decompression and reduction, C4 corporectomy, C3–5 anterior and posterior fusion.
- On ITU postoperation with hard collar (for 6 weeks) and to stay on the turning bed (until lumbar surgery).
- Minimal respiratory effort postanalgesia, so remained intubated and ventilated via an endotracheal tube (ETT).
- Surgeons requested tracheostomy be delayed for 1 week to avoid infection to cervical metalwork.

Day 6

- No spontaneous breaths, rapid desaturation to 70%, secondary to a sputum plug, resulting in a cardiac arrest and asystole for 1 minute.
- On-call physiotherapy requested.

Week 2

- Asystolic events continued, up to 5 times a day, precipitated by turns, washing and physiotherapy.
- A temporary pacemaker was inserted to minimise the ensuing asystolic episodes following tracheal stimulation.
- At this stage chest physiotherapy was being given four times per day to manage thickened

secretions.

Week 3

- L1–4 posterior fusion was performed.
- Occasional spontaneous breaths were noted, continuing agitation required ongoing sedation.

Week 4

- Switched to a Breas™ (mobile) ventilator via a tracheostomy to facilitate transfer to the ward.
- Temporary pacemaker removed.
- There was sudden onset of acute renal and liver failure which required haemofiltration and he remained in ITU.
- Septic shock followed the next day, leaving the patient unresponsive, left eye bloodshot and pupil dilated.
- Occasional spontaneous breaths ceased.
- Thick secretions continued.

Week 5

- Bouts of asystole returned, he showed signs of multiorgan failure and pulmonary oedema was noted during suctioning.
- A CT scan of his brain ruled out any causes in the brain, the neurologist diagnosed 'renogenic encephalopathy'.
- Thick secretions continued to require chest treatment.

Week 6

- Further investigations (MRI brain and electroencephalography (EEG)) were normal, although a CXR showed an enlarged heart, with further investigation by echocardiogram a pericardial effusion was detected (believed to be due to pacing wire removal).
- A pericardial drain removed 800 mL of fluid.

Week 7

- No asystolic events noted.
- Thick secretions continued to require treatment.

Week 8

- Returned to acute spinal ward, with secretions less thick.

Week 12

- Began nodding to questions appropriately.
- Limited R hip flexion was noted, X-ray confirmed heterotrophic ossification.
- The tracheal cuff was deflated, allowing return of voice.
- Oral feeding commenced under guidance of the speech and language therapist.
- Tracheostomy was changed to a 'cuffless' version.

Week 13

- Mobilised into a wheelchair.

Week 15

- Began attending physiotherapy gym.
- Spontaneous respiratory effort achieved using intermittent positive pressure breathing (IPPB).

Week 20

- Formal respiratory weaning programme commenced, with no further use of the ventilator required day or night 12 weeks later (week 32).

Week 46

- Discharged to a neurological care home with an ongoing physiotherapy programme.

Summary

This case highlights the dramatic and almost catastrophic events that may accompany a SCI. The reader should appreciate how a patient may make an excellent recovery from the cardiorespiratory, neurological and multisystem complications that can occur with very little warning alongside the presenting spinal cord signs and symptoms at any time during the rehabilitation process.

Case Study 16.3 T6 Complete spinal cord injury (AIS A)

Background

- 36-year-old male.
- Self-employed mechanic.
- Living with partner.
- Previously fit and healthy.
- No significant past medical history.

History of spinal cord injury

- Fall over handlebars of a motocross bike during a race.
- Initial loss of consciousness and unable to move legs.
- Admitted to local hospital where underwent MRI which showed:
  - complex fracture of T6 extending through vertebral body
  - narrowing of spinal canal at T6
  - fracture T7
  - large paraspinal haematoma.
- Initially managed conservatively on bedrest.
- Transferred to Spinal Injuries Unit (SIU) 2 days post injury where he underwent surgical fixation T5–T8 with screws and bone grafting and decompressive laminectomy at T6, 4 days post injury.
- First mobilisation in wheelchair 9 days post injury.
- Commenced attending physiotherapy gym and active rehabilitation 6 days after first mobilisation.
- Discharged home 4 months post injury.

Assessment

- Initial transient type II respiratory failure secondary to analgesia.
- Reduced vital capacity (2.65 L) and strength of cough.
- Full passive range of motion in both shoulder girdles.
- Pain at fracture site and left shoulder.
- No active movement or sensation below T6.

Acute/bedrest management and early rehabilitation

- Respiratory management:
  - Use of intermittent positive pressure breathing (IPPB) for type II respiratory failure, incentive spirometry, assisted cough when required.
- 24-hour positioning regime including, positioning into frog position and ankles being positioned in neutral using pillows for support.

- Daily passive movements for lower limbs.
- Active movements for upper limbs including strengthening exercises.

Active rehabilitation

- During this period the patient commenced attending the gym, spinal cord injury education sessions and multidisciplinary goal planning.
- Long-term and short-term goals were identified and broken down into component parts, working towards independent wheeled mobility, independent transfers including car and wheelchair into car, knowledge of all aspects of spinal cord injury, independent management of skin, bladder and bowels, independent activities of daily living.
- A specific goal was set by the patient which was to achieve floor to chair transfers so he was able to propose to his girlfriend whilst on one knee.
- Employment, driving and leisure activities were discussed and information re: access to work, inclusive fitness initiative and driving assessment was given.
- Psychological support and family counselling provided by psychologists.

Assessment

- In addition to the initial assessment the following points were identified during the rehabilitation process:
  - Generalised pain around posterior aspect of the left shoulder and pain following the orientation of the biceps
  - Decreased left upper limb strength with muscle wasting secondary to suprascapular nerve damage, infraspinatus = grade1 and supraspinatus = grade 2
  - Decreased active external rotation left shoulder
  - Altered alignment of shoulder girdle into abduction during functional tasks
  - Altered glenohumeral rhythm and reduced scapula stability
  - Dependent on assistance for all mobility and activities of daily living
  - Development of para-articular ossification, therefore at risk of decreased hip range of movement
  - Development of neuropathic pain in buttocks requiring analgesia.

Management

- Matwork activities commencing with balance and lifting in long and short sitting, rolling and lying to sitting.
- Transfer practice starting with level transfers using a sliding board and assistance of 1, progressing to independent level transfers and advanced transfers including, toilet, shower seat, bath, car and bumming up and down stairs.
- Standing using tilt table progressing to Oswestry standing frame (OSF) for stretching,

weight bearing and circulatory management.

- Upper limb strengthening including rotator cuff using weights, Thera-Band and traditional exercise equipment.
- Wheelchair skills pushing on level, up slopes, over uneven ground, backwheel balance, up/down kerbs and transferring wheelchair in/out car in driver's seat.
- Trial and selection of appropriate wheelchair and pressure-relieving cushion.
- Cardiovascular fitness activities, sport, hydrotherapy.
- Specific strengthening of infraspinatus and supraspinatus muscles through therapy facilitation, sling suspension, Thera-Band exercises, FES, functional exercises with and without FES to maintain alignment (e.g. feeding, drinking), scapular stability exercises and serratus anterior strengthening.
- Independent stretching and exercise programme for upper limbs and lower limbs.
- Trial and self-funded purchase of FES bike for cardiovascular fitness.
- Commenced regular weekend leave trips 2 months after injury.

Outcome

- Discharged home with appropriate wheelchair and cushion.
- Independent in all activities of daily living and transfers.
- Able to manage skin, bladder (via suprapubic catheter) and bowel independently.
- Returned to work and driving.
- Proposed to girlfriend (who said yes!) on one knee, but required minimal assist for transfer back into wheelchair.
- Provision of upper limb stretching and strengthening programme and lower limb stretching programme.
- Reduced activity, altered alignment and active range of motion into external rotation of upper limb and shoulder girdle (L).
- Referred for local outpatient musculoskeletal physiotherapy for suprascapular nerve damage management.
- Attending motocross meetings and returned to leisure activities.
- Able to attend local swimming pool and gym.

Case Study 16.4 C3 Incomplete spinal cord injury (AIS D)

Background

- 51-year-old male.
- Self-employed electrician.

- Married with 2 children living at home.
- Previously fit and healthy.
- No significant past medical history.

History of spinal cord Injury

- Fall over handlebars of a mountain bike into a stream.
- Found by wife, initially unconscious and unable to move arms and legs.
- Admitted to local hospital where spinal cord contusion of C3–5, but no bony injury was identified.
- Managed conservatively using hard collar and bedrest.
- Transferred to Spinal Injuries Unit (SIU) 10 days post injury where he was managed conservatively for total of 6 weeks on a turning bed, using head blocks for immobilisation.
- Diagnosed with central cord syndrome.
- First mobilisation in wheelchair wearing a hard collar 6 weeks post admission to the SIU.
- Commenced attending physiotherapy gym and active rehabilitation 1 week later.
- Discharged home after 6 months.

Assessment

- Reduced vital capacity and strength of cough.
- Reduced range of motion in both shoulder girdles (L>R) specifically into flexion and lateral rotation.
- Altered alignment of shoulder girdle and upper limb into elevation and protraction of scapulae, internal rotation, abduction and extension of glenohumeral joint with elbow flexion with shortening of pectoralis minor.
- Neurogenic and nociceptive pain in both shoulders.
- Altered movement pattern of shoulder girdle with initiation from levator scapulae and upper trapezius.
- Reduced activity and selectivity of hand movement (L>R).
- Altered sensation and proprioception of shoulder girdle, upper limbs, hands and lower limbs.
- Weakness and decreased activation of lower trapezius, serratus anterior, triceps, rhomboids.
- Decreased activation of abdominals during upper limb activities or lower limb activities.
- Unable to gain selective head, neck or trunk movement, decreased visual field and deconditioning due to immobilisation.
- Reduced activity and selectivity of lower limbs.
- Anxiety and fear.

Acute/bedrest management and early rehabilitation

- Respiratory management:
  - Use of intermittent positive pressure breathing (IPPB) prophylactically, incentive spirometry, assisted cough when required.
- 24-hour positioning regime including: positioning into unilateral and bilateral crucifix of upper limbs alternating with upper limb abduction and lateral rotation, frog position and ankles being positioned in neutral using pillows for support.
- Daily passive movements for upper limbs and lower limbs progressing to active assisted when possible.
- Sensory stimulation of scapulae, upper limbs, hands and lower limbs through therapist and autostimulation, i.e. stroking and touching joints of upper limbs, tapping and rubbing hands together (with assistance), touching face, hair, etc. to provide afferent stimulation of cutaneous and joint receptors to improve/maintain body schema.
- Soft tissue mobilisation to gain appropriate length of tight/malaligned structures around scapula and throughout the upper limbs.
- Alignment of shoulder girdle with facilitation and activation of appropriate musculature and stability, and inhibition of inappropriate activity of upper trapezius and levator scapulae activity in varying ranges and movement patterns. Specific activation of lower trapezius, serratus anterior, rhomboids and triceps.
- Activation of trunk and core stability through upper limb activities in supine and lower limb activities in crook lying.
- Accessory movements of shoulder girdle.
- Family were taught passive and assisted stretches, sensory stimulation and the patient encouraged to carry out sensory stimulation independently.

Active rehabilitation

- During this period the patient commenced attending the gym, spinal cord injury education sessions and multidisciplinary goal planning.
- Long-term and short-term goals were identified and broken down into component parts, working towards independent mobility through walking, knowledge of all aspects of spinal cord injury, independent management of skin, bladder and bowels, independent feeding and activities of daily living.
- Employment, driving and leisure activities were discussed, but specific goals were not set by the patient.
- Throughout the rehabilitation process the patient and his wife, when able, had regular sessions with a clinical psychologist to address psychological factors, which included reduced insight into the long-term implications of his injuries.

Assessment

- In addition to the initial assessment the following points were identified during the rehabilitation process:
  - Decreased trunk mobility
  - Altered alignment of trunk and postural control in sitting, standing and during gait
  - Decreased weight bearing through left lower limb in standing and during stance with altered alignment and activity around pelvis, hip and knee
  - Decreased stability around pelvis
  - Over-activity of back extensors to provide pelvic stability
  - Over-activity of left latissimus dorsi to gain swing on left
  - Weakness of gluts, quads (L>R)
  - Reduced muscle length specifically hip flexors and plantarflexors (L>R).

Management

- Sensory stimulation, soft tissue mobilisation, alignment, activation and carryover into function of upper limbs through therapy facilitation and use of FES (functional electrical stimulation) particularly for scapula alignment and external rotation.
- Weight-bearing exercises through upper limbs to improve dynamic stability and sensory stimulation.
- Trunk mobilisations.
- Alignment and postural control activities in sitting, standing and moving into weight transference, step standing and gait.
- Attendance at Pilates class to improve postural control.
- Early gait rehabilitation using body weight support treadmill and overground therapy facilitation and progression through to step ups and stairs.
- 2–3 times weekly aquatic therapy to address soft tissue length, early and late gait rehabilitation, swimming and strengthening.
- Independent stretching and exercise programme.
- Cardiovascular fitness activities, strengthening exercises, gait rehabilitation and preparation for discharge using cross trainer, treadmill, exercise bike and rowing machine at local gym.
- Specific strengthening of gluteal and quadriceps muscles through therapy facilitation, sling suspension, FES, functional exercises (e.g. step ups) and use of a FES bike for 8-week period.
- Assessment and provision of Odstock Drop Foot Stimulator (ODFS) on left gluteals to improve pelvic and trunk stability and alignment and hip extension during gait.
- Trial of various splints and orthoses to improve alignment of upper limb at night and provide sustained stretch and to improve postural alignment during waking and mobilising hours.

- Regular assessment and outcome measures, e.g. 10-minute timed walk, 6-minute walk, BORG scale of exertion, range of motion, muscle power, visual analogue scale for pain.

Outcome

- Discharged home with no aids or wheelchair, using ODFS on left gluteal muscles to improve gait pattern.
- Able to walk 1 mile independently.
- Independent in all activities.
- Reduced activity, altered alignment and range of motion of upper limb and shoulder girdle (L>R).
- Referred for local community/out-patient neurophysiotherapy.
- Provision of stretching and strengthening programme using Pilates-based exercises.
- Able to attend local swimming pool and gym.
- Able to participate in family life.

Chapter 16 Spinal injuries multiple choice questions

1. What is the estimated incidence of spinal cord injury (SCI) per year in the UK?
   a). 200–500
   b). 800–1000
   c). 2500–3000
   d). 5000–6000
2. Which of the following statements is true?
   a). A newly qualified physiotherapist is unlikely to see a SCI patient in their first year of practice
   b). A newly qualified physiotherapist is likely to see a SCI patient in their first year of practice, but only those with an established injury
   c). A newly qualified physiotherapist may be required to see a SCI patient in their first year of practice, but only new traumatic injuries
   d). A newly qualified physiotherapist may not see a SCI patient in their first year of practice, however there is always a possibility, so access to some background knowledge is advisable
3. A physiotherapist, regardless of their experience, when presented with a SCI patient, should:
   a). Consider which of their neurological skills they will use for this primarily neurological presentation
   b). Not assess or treat a SCI patient until they have spoken to a specialist SCI centre
   c). Consider how their neurological, musculoskeletal or respiratory background could assist the management, potentially using a combination of all three as they are interlinked
   d). Liaise with their closest SCI centre only once a referral has been made to them.

4. According to recent data, the most common mechanism for a traumatic SCI in the British Isles is?
   a). Road traffic collision
   b). Falls
   c). Sport
   d). Assault/violence
5. The majority of reported SCI occur in the ...
   a). Cervical spine
   b). Thoracic spine
   c). Lumbar spine
   d). Sacral spine
6. The 'neurological level' in SCI is considered to be ...
   a). The first segment of the spinal cord where neurological impairment is evident
   b). The last level of normal neurological function
   c). The predicted spinal cord level the treating team believe function will return to
   d). The level of the vertebral fracture
7. A patient presenting with an AIS (American Spinal Injury Association [ASIA] Impairment Scale) C injury is considered to have ...
   a). An injury affecting the cervical spine
   b). A complete spinal cord injury
   c). A motor incomplete SCI, the majority of 'key muscles' having an Oxford grade less than 3
   d). A motor incomplete SCI, the majority of 'key muscles' having an Oxford grade greater than 3
8. The C6 'key muscle' used in the ASIA standard neurological classification of SCI is ...
   a). Wrist extensors
   b). Elbow flexors
   c). Elbow extensors
   d). Shoulder abductors
9. Which statement about respiratory function post SCI is true?
   a). Only patients with tetraplegia may require a manual assisted cough
   b). Deterioration in respiratory rate and vital capacity is potentially the first sign of ensuing respiratory failure and may be present even when $PaCO_2$ remains within normal limits
   c). Manual techniques, especially assisted coughs, are contraindicated in an unstable spine
   d). A patient with an injury at C2 has no respiratory muscles remaining innervated
10. Which of the following statements is false?
   a). Passive hip flexion should be limited to 30° in an unstable spine T10 and below, unless otherwise instructed by your consultant
   b). A loss of just 5° of range in elbow extension can make an otherwise independent patient with C6 tetraplegia require assistance

c). Preservation of pin prick sensation has been linked to a likelihood of motor recovery in the related myotome

d). Passive shoulder flexion should never be taken above 90 degrees in an unstable cervical spine

11. When assessing muscle function in a SCI patient, a physiotherapist should?

a). Allow visualisation of the limb being tested, as loss of proprioception does not always mean loss of motor function

b). Be aware of typical 'compensations' developed by patients of a given neurology, and use appropriate handling during the process to allow assessment of true preservation of motor function

c). Take into consideration a patient's age, as well as any pain, abnormal tone, sedation or psychological factors which may alter the outcome

d). Incorporate all of the above in the assessment

12. An otherwise uncomplicated patient presenting with C6 complete tetraplegia has the functional potential to?

a). Floor to chair transfer independently

b). Wheelchair to car transfer independently

c). Self propel a manual wheelchair, but only on flat surfaces

d). Write a letter, but only using a computer, not with a pen and paper

13. Hypertonus in SCI ...?

a). May be due to bladder or bowel distension, not only altered neurological control and secondary adaptations of passive musculoskeletal components

b). Should always be eliminated, as it serves no functional purpose

c). Is assessed using the Ashworth Scale only, as all other assessment tools are of no benefit to the clinician

d). Should never be managed with a positioning program as this may affect spinal alignment

14. Which of the following statements is true?

a). Physiotherapists are unable to assist skin management, so any issue should be left to the tissue viability nurse

b). A SCI is a localised central nervous system disorder, as such; it is highly unlikely that any cognitive impairment will be evident in the vast majority of patients

c). Psychologically, a SCI may have an impact on not just the patient, but also their family, friends, other patients and staff. All should be considered within the delivery of care

d). A collar or brace is required when there is spinal instability, so these should only be seen on patients on a turning bed

15. Which of the following transfers may a physiotherapist be required to assess and teach in a patient with T10 paraplegia?

a). Floor to chair

b). Bath transfer

c). Chair to car

d). All of the above

16. Factors that may affect a patient achieving their functional potential for a given level include all the following except:
    a). Pain or spasm
    b). Gender or race
    c). Body shape (morphology) or previous medical history
    d). Age or psychological factors
17. Initial acute management in SCI does not always need to include?
    a). Adequate management of pain
    b). Maintenance and optimisation of spinal alignment
    c). Prophylactic respiratory, joint and skin management
    d). Intravenous high-dose methylprednisolone
18. The suggested management of unopposed vagal tone in acute tetraplegia and the related risk of recurrent bradycardia and asystolic arrest is ...
    a). Insertion of a temporary pacemaker
    b). Pre-oxygenation and use of a sympathomimetic prior to physiotherapy, especially suctioning
    c). Avoiding delivery of chest physiotherapy until the symptoms resolve, as this is most likely to stimulate the response
    d). Using a mechanical insufflator–exsufflator (e.g. Cough Assist™) instead of manual assisted coughs
19. The 'tenodesis grip' is an allowable compensation wherein ...
    a). Controlled active shortening of the long finger and thumb flexor tendons assist a patient with C6 or C7 tetraplegia achieve a functional grip
    b). Active wrist flexion results in a functional grip for those with C6 or C7 tetraplegia
    c). Patients with C8 tetraplegia achieve active finger flexion for grip
    d). All 10 digits of the hands are used for a functional task in tetraplegia
20. When mobilising a SCI patient into a wheelchair for the first time, the physiotherapist should ensure ...
    a). They have been able to maintain supported balance on the edge of the bed first
    b). An abdominal binder has been used continuously for the 24 hours prior to mobilisation
    c). Ephedrine, antiemetics and analgesia are given immediately after the patient is in the chair
    d). The patient has spent time beforehand sitting up in bed using the inbuilt bed mechanics

Spinal injuries multiple choice answers

1. b)
2. d)
3. c)
4. b)

5. a)
6. b)
7. c)
8. a)
9. b)
10. d)
11. d)
12. b)
13. a)
14. c)
15. d)
16. b)
17. d)
18. b)
19. a)
20. d)

Chapter 17

Trauma Orthopaedics

In-patients

- Trauma orthopaedics covers a multitude of injuries that are admitted to hospital in varying ways.
- It can range from those patients who walk in via Accident and Emergency (A&E) or fracture clinic with minor injuries, to those that are brought in by ambulance with life-threatening multi-trauma injuries.
- No matter how they arrive their assessment starts as soon as they enter the doors of the hospital.
- A doctor will always admit the patient and collect a lot of useful information that you as a physiotherapist will need to know prior to assessing a patient.
- This will not be an exhaustive list, therefore it is essential that a thorough subjective assessment is carried out.
- Due to the high-energy nature of many of the injuries encountered on a trauma orthopaedic ward, it is likely that your patient will present with multiple injuries.
- A common mistake in assessment of trauma orthopaedic patients is to concentrate on their obvious injury.
- Because fractures are extremely painful, it is quite common for a soft tissue injury to be missed initially and only to be discovered at a later date, e.g. a patient may present with a tibial shaft fracture; however, the less obvious rupture of the posterior cruciate ligament may be missed.
- It is often a physiotherapist that discovers these secondary injuries.
- Because of this it is essential to complete a thorough subjective and objective examination of all limbs, in addition to the patient's 'obvious' injury.
- Many patients who are admitted to a trauma ward will have associated wound and plastics issues from open fractures or fasciotomies.
- This is covered in Chapter 4 in this volume and in Volume 2.
- Unlike elective orthopaedics or sports physiotherapy, you will see many patients that have been admitted to hospital following severe accidents.
- The patient may have difficulty talking about their accident in circumstances where they have been involved in a fatal collision possibly involving other family members or where they feel at fault for their accident.
- This will affect patients in different ways, so they must be approached in a caring manner respecting their right to decide when they are ready to start physiotherapy.
- In this chapter the assessment approach covers the period from when the patient is

admitted to hospital through to their discharge and subsequent referral to outpatient physiotherapy.

Subjective assessment

- Like any acute ward, there are many different places to gather information about a patient, e.g. medical notes; doctor's admission sheet; talking to the patient's nurse and other members of the multidisciplinary team and X-rays.
- It is essential to realise that the subjective examination is an ongoing process and it is not always possible to collect all of the information from a patient on the first day. There are a wide variety of reasons that may prevent you from completing your assessment, such as drowsiness from anaesthesia, pain or confusion due to a head injury or dementia.
- In these cases, if possible, look to find out more information from their relatives or friends.
- In trauma orthopaedics, the type of information that is required may be similar to that required in other clinical settings that enable a clinical picture to be established. Examples of the questions specific to the trauma setting are outlined in Table 17.1.
- Once the subjective assessment has been completed, this should enable the objective assessment to be planned and the formulation of ideas relating to the patient's treatment goals and their discharge plan.

Table 17.1 A range of trauma-specific questions used during subjective assessment

Information	Questions
Mechanism of injury	Was it a high-energy injury such as a car crash or a low energy injury such as a simple fall?
Area and type of fracture	Which part of the body is affected?
	Was it an open or closed fracture?
	Was it a simple transverse or a multifragmented spiral fracture?
Treatment method	Is it non-operative or operative?
	Are there any casts or braces needed?
Past medical history	Does your patient have any condition that will impact on their rehabilitation?
	See trauma outpatient section for good examples of this
Previous mobility	Were they:
	independent with no aids?
	using a frame?
	having recurrent falls?
	Can they do stairs?
Previous ROM/strength	Were they normally fit and healthy or do they have contractures or weakness?

Neurovascular status	Have they had previous vascular issues due to diabetes or do they normally have a foot drop?
Social history	What job do they need to get back to?
	Do they:
	play sport?
	live alone?
	have carers?
	have children?
	live in a house with stairs?
Drug history	What medications are they normally on?
	Are they a drug user?

Objective assessment

- It may not be possible to carry out a full objective assessment on the first day.
- This can be an ongoing process that will continue through to discharge.
- The objective assessment will generally follow a standard manual therapy format along the lines of a musculoskeletal textbook (Petty 2006).
- As patients will have different injuries and post operative instructions, it is essential to make the assessment specific to individual circumstances.
- If a patient requires an operation, then both preoperative and postoperative assessment will need to be completed.
- The areas commonly requiring assessment are as follows.

Pain

- Pain is a big issue following a traumatic injury and subsequent surgery.
- The amount of pain can be evaluated using various tools, e.g. Visual Analogue Scale (VAS).
- It is essential to assess a patient when they are covered by pain relief, to ensure information gained is as reliable as possible.
- If the patient experiences too much pain to continue then it is possible to request additional pain relief from the nursing staff, or alternatively return to see the patient later when their pain is under control.

Imaging

- A major part of assessment will be reviewing and understanding any imaging the patient may have had.
- The most common images are X-rays, computerised tomography scans (CT scans), ultrasound scans and magnetic resonance imaging (MRI); Table 17.2, outlines where

these may be used.
- A physiotherapist will be expected to be able to examine an X-ray and determine whether it is normal or not.
- Although it is useful to be able to interpret CT and MRI scans, it is not expected that physiotherapists will be able to read these.
- A radiologist will review and report on all imaging and this will be a useful adjunct to the assessment.

Table 17.2 Imaging and examples of use

Imaging type	**Examples of use**
X-rays	Initial imaging for suspected fracture/s
CT	Provides a better understanding of the extent of a fracture and potential management, e.g. a multi-fragmented tibial plateau fracture
Ultrasound	Tendon ruptures, e.g. quadriceps tendon
	To determine soft tissue injury in a joint, e.g. ACL rupture
MRI	Assess neurological injury, e.g. sub-dural haematoma or spinal cord injury
	To visualise a fracture if not visible on X-ray, e.g. undisplaced hip fracture

Observation

- Assessment begins as soon as the patient is seen.
- It is good practice to stand at the end of a patient's bed and observe the following:
  - Position they are in
  - Any drains or lines that are attached to them
  - Their limb position
  - Any swelling? If so where
  - What casts, splints or braces they have
  - Any traction in place
  - Red swollen areas, question whether this is due to infection, especially if stitches are in situ.
- If the wound is covered in a dressing it is essential to notify the patient's nurse so that the dressing can be taken down and the cause established.

Palpation

- It is good practice to palpate the patient's affected and unaffected limb.
- Assess for any differences in size due to swelling or muscle wastage, any hot and inflamed areas and any tender areas.
- Good palpation can often lead to diagnosis of complications that can arise due to the

patient's injuries, e.g. compartment syndrome or deep vein thrombosis.

Chest assessment

- Most patients that are admitted to a trauma ward will need a routine chest assessment for a variety of reasons.
  - Previous respiratory history
  - Prolonged bed rest due to their injury
  - Administration of a general anaesthetic
  - Admission with chest trauma, e.g. rib fractures, pneumothorax, haemothorax or lung contusions.
- If a patient is due an operation, then it is prudent to assess their chest pre- and postoperatively.

Neurovascular status

- Due to the high-energy nature of traumatic injuries, pre- and postoperative assessment of a patient's neurovascular status is often required.
- Neurological damage can be due to a head injury, a spinal cord injury or a peripheral nerve injury.
- The physiotherapist should routinely consider if there are any abnormal sensation, altered pulses, loss of bladder or bowel control or power loss.
- Findings (positive or negative) must be recorded, to assist with identification of the cause of any neuropathy.
- This is especially important for patients with spinal injuries.
- It will help to monitor changes in a patient's neurological symptoms as a result of surgery.
- Follow the standard neurological assessment as described in a textbook to assess a patient's neurological status (Petty 2006).
- Any neurological symptoms should be recorded on a body chart and muscle chart. These can be filled out preoperatively, postoperatively and at regular intervals until symptoms have normalised or plateaued.
- In the case of spinal injuries, an American Spinal Injury Association (ASIA) score should be completed (http://www.asia-spinalinjury.org/).
- Swelling is a common outcome of traumatic injuries and operative procedures, entailing assessment of a patient's vascular system.
- This can be as simple as checking for abnormal skin colour, skin temperature and capillary refill.
- In the acute phase, any abnormal neurovascular status must be reported to a doctor immediately, in case it is due to a limb-threatening condition, e.g. compartment syndrome.

Range of motion (ROM)

- Before assessing ROM of any joint, check for any restrictions imposed by the surgeon.
- Example of instructions could be:
  - No movement at all, e.g. wearing a non-removable cast for 6 weeks or a backslab for a week to allow wounds to settle
  - Restricted range of motion in a brace e.g. 0–30° for 2 weeks following a patella tendon repair
  - Full active ROM, but no passive ROM.
- Measure range using a goniometer and avoid 'eye balling' ROM.
- If the patient is not allowed to move their affected limb, it is still essential to assess and document the ROM of their unaffected joints.
- Most patients will have reduced ROM and it is necessary to document any reasons for this, e.g. swelling, wound position, dressings or pain.
- If a wound is found to be oozing, then immediately inform the patient's nurse.

Muscle power

- Assessing muscle power of the affected limb can be difficult in the acute trauma setting as there are many factors that will affect strength, such as pain, swelling, dressings and wounds.
- Look out for any external agents that can reduce muscle power such as epidurals or nerve blocks used during surgery.
- With this in mind, test each muscle methodically and document any muscles testing weak using the Oxford scale (Kendall and McCreary 2005).
- Patients can become weaker due to prolonged bed rest, therefore it is essential to assess the muscle power in all of the unaffected limbs as well.

Function

- Assessing a patient's functional mobility is a major component of the assessment, which enables the therapist to inform nursing staff how to transfer them.
- The information will also inform the patient's treatment and discharge plan.
- Be aware of any restrictions that the patient may have from their injuries and subsequent operations or from previous medical conditions, e.g. a 60-year-old man with a fractured patella may be restricted by a knee brace to prevent knee flexion and a previous stroke that has left him with a hemiparesis.
- Functional tasks include the following:
  - Rolling
  - Bed transfers
  - Sitting balance

– Sit to stand
– Standing balance
– Transfers
– Mobility
– Stairs.

- Whilst assessing these different functions consider the following:
  – Amount of assistance needed, both in numbers and physical demand, e.g. moderate assistance of two people
  – Side of the bed they are transferring from and to
  – Any equipment that may be required such as bed levers, frames or wheelchairs
  – Technique the patient is using to complete the task and any 'cheating' techniques they are using.

Mobility

- There are a number of different ways that patients mobilise following trauma, ranging from independent walking with no aids, transfers using hoists, to slide transfers into a wheelchair.
- When first assessing a patient's mobility, it is crucial to choose the safest option.
- The choice will largely depend on a patient's age, previous mobility, injuries and doctor's instructions on weight bearing.

Types of weight bearing

- The patient's ability to weight bear will depend on their injury and doctor's instructions.
- The physiotherapist must know how much weight the patient can take through each limb before undertaking a functional assessment.
- When determining each limb's status, plan what equipment will be needed to ensure the patient can have their mobility and function assessed.
- Examples of the types of weight bearing are outlined in Table 17.3.

Table 17.3 Main types of weight bearing encountered on a trauma unit

Weight-bearing status	Description	Examples of Injury
Non-weight bearing (NWB)	No weight to be taken through the affected limb	Spiral tibial fracture
		Humerus fracture

Touch weight bearing	The patient can take only the weight of their limb through their affected limb (approximately 4–8 kg, 10–20 lb)	Acetabulum fracture
		Screw fixation of hip fracture
Partial weight bearing (PWB)	The patient can take up to 50% of their weight through their affected limb	Transverse femoral fracture
Full weight bearing (FWB)	The patient can take all of their weight through their affected limb	Hip replacement

Gait patterns

- If a patient is allowed to touch weight bear or more, it is essential to assess their gait pattern during stance and swing phase.
- There will be many factors that will influence gait, such as pain, ROM, muscle tightness, splints or footdrop.
- It is important to objectively measure and document any of these factors.
- Another cause of abnormal gait after an operation could be a leg length discrepancy, which should be considered particularly following hip or pelvis surgery, but also after any type of lower limb surgery.

Treatment planning

- The subjective and objective assessment findings will enable a treatment plan to be formed in consultation with the patient including the defining of SMART goals that will relate to the patient's treatment programme through to discharge from hospital and referral for outpatient physiotherapy.

Trauma orthopaedic outpatients

- Information gathered before the assessment will assist in identifying the patient's issues, for example if the referral is from an A&E department, there may be an X-ray that can be viewed. If the referral is from an inpatient trauma team, there may be an operation note including details of the specific structures that have been operated on.
- The patient will expect the physiotherapist to know about the implications of any surgery they may have had and the prognosis relating to this, therefore it is important to become familiar with procedures and post-operative routines.
- The patient may be asked to complete outcome measure forms as they enter the department. The information provided can indicate the degree of ability/disability that the patient feels they have as a result of their injury (Box 17.1).

Box 17.1 Examples of outcome measures

Limbs

Lower Extremity Function Score (LEFS) (Binkley et al 1999)
Disability of the Arm, Shoulder and Hand (DASH) (Solway et al 2002)

Spine

Oswestry Disability Index (ODI) (Fairbank & Pynsent 2000)
Neck Disability Index (NDI) for the cervical spine specifically (Vernon & Mior 1991)

General

The Patient self-efficacy score, assessment of the patient's ability to cope with their injury and pain (Bandura 1997)

Subjective assessment

- Trauma out-patient assessment follows the standard format for out-patients (Petty 2006).
- The assessment begins at the moment the patient is first observed.
- Look at the way that they move if they have to walk in from a waiting area, the way they sit down, the way that they stand up and move in the assessment area.
- Are they using a walking aid/s? How they are using them? Are they wearing a sling or a brace?
- Gauge how much pain they are in by their body language. Non-verbal information can be as important as what the patient tells you.
- Are they following any instructions that they have been given, e.g. are they full weight bearing, when they are supposed to be touch weight bearing?

History of present condition

- The amount of detailed information obtained about the history of the present condition is extremely important in assisting the physiotherapist form a hypothesis, make a diagnosis and understand a patient's journey from injury to the point where they have been referred for physiotherapy out-patient management.
- The mechanism of the injury will help determine the primary diagnosis, and also how other structures may have been damaged during the accident.
- For example, the questions to ask a patient who has received a twisting injury to the knee during a game of rugby.

- How exactly did it happen?
- Which way did the knee twist?
- Was there any other force/s being applied to the leg, such as those received during a tackle from the side?
- Was there an audible noise?
- Was a ‘pop’, ‘click’ or tearing sensation felt?

- Based on this information, it may be possible to reason which structures have potentially been damaged.
- It may not be possible to gain a clear indication of the mechanism of the injuries, if for example the patient was involved in a road traffic accident, where they lost consciousness. Alternatively, they may be able to remember the accident vividly, and therefore it may distress them to talk about it in too much detail.
- It might also be helpful to establish if there are any legal proceedings following the accident. The patient may be less likely to be truthful in their answers or may display other emotions such as anger, frustration and also depression.
- If the patient is subject to a compensation claim their focus may be on the prospect of compensation rather than on their recovery.
- Each patient may have a different journey before they reach the out-patient department. The journey can indicate the extent of the issues that have been managed post injury (Figure 17.1).
- It is important to gauge what the patient has been doing between their operation or diagnosis and the start of their out-patient physiotherapy. If the patient is seen initially in a clinic setting, it may not be possible to find this out due to the time available; however, it is important that this information is obtained.
    - Have they been given any exercises?
    - Have they been doing them?
    - How often?
    - Have they been using ice or analgesia?
    - Have they been following their doctor’s instructions?
    - If not, why not?
    - The answers will indicate how compliant they have been with instructions and doing any exercises.

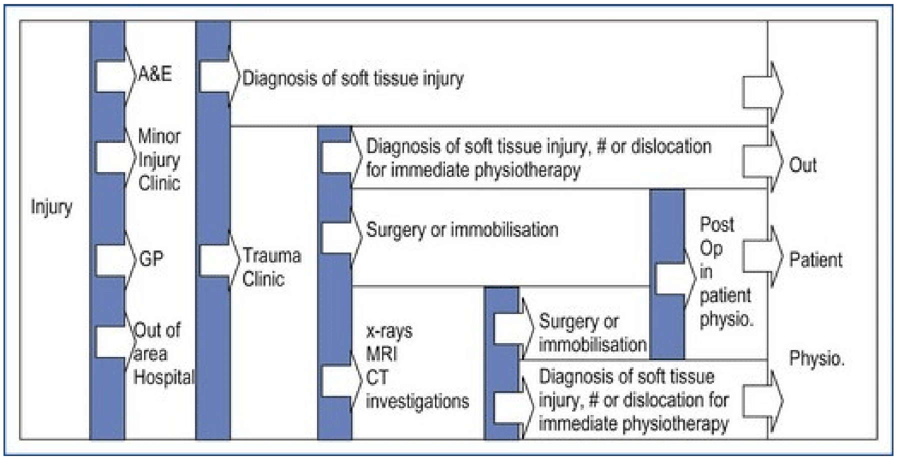


Figure 17.1 The routes to outpatient physiotherapy.

Past medical history (PMH)

- The PMH may provide information about previous health issues that will help you to make decisions about how the patient may respond to treatment and any potential contraindications or precautions that need to be considered.
- Table 17.4 lists some of the more common conditions that may be encountered.

Table 17.4 Examples of conditions and factors to be considered when planning an assessment

Condition	**Potential effect on patient's management and adaptations to treatment**
Hypothyroid	Can easily fatigue, if not controlled. e.g. may benefit from having a Zimmer frame as well as elbow crutches at home, if non-weight bearing
Heart and chest problems	Over exertion may cause problems such as shortness of breath or angina, e.g. reduce duration and difficulty of treatment to avoid this and ensure that they replicate this at home
Rheumatoid arthritis	May have pains in multiple joints, e.g. may need Fischer crutches for mobility. Avoid excessive loading of joints to avoid exacerbation
Diabetes	Can cause slow healing of bone, soft tissues and wounds. Ensure wounds are being monitored carefully by GP (or by a health care professional trained to deal with wound care). Treatment progression can be delayed as a result
Use of long-term steroids	Can cause thinning to the skin and ligaments to become weaker. Be careful with soft tissue work, such as cross friction massage

Previous injury to same area – must also ask if the patient had physiotherapy treatment after this injury. This can indicate how well patient may respond to repeating certain treatment modalities	Fractures – outcome may be worse as the joint and soft tissues will have old scar tissue and damage, causing increased stiffness
	Sprains – need to make sure that proprioception training is included in treatment to try to stop recurrent problems
	Dislocations – recurrent dislocations usually need surgery, therefore this needs to be discussed with the surgical/medical team or GP
Previous injury to different area	Previous fractures to opposite leg or to upper limbs can affect a patient's ability to use walking aids. This also applies to patients with osteoarthritis
	A number of previous fractures may suggest that the patient needs to be tested for osteoporosis

Drug history

- It is important to know what medication the patient is taking. If they are on strong analgesia such as tramadol or Oramorph, then the patient should be given a more cautious assessment, as the analgesia may be masking symptoms that may be provoked relatively easily if they were not taking pain relief.
- Note whether a patient is on anticoagulant medication, as they can bruise easily or experience bleeding into joints or soft tissue structures.
- The type of medication the patient is taking may provide a clue about the nature of their symptoms, e.g. neuroleptic medication may indicate the presence of neural pain, non-steroidal anti-inflammatory drugs (NSAIDs) may indicate that the pain is chemical in origin.
- Patients may need to be educated about how to take their medication for it to provide optimal effect, e.g. the need to take NSAIDs as an ongoing course as prescribed.

Social history

- The social history will help to understand what the patient wants to return to and will provide information to assist the setting of treatment goals.
- When discussing the patient's work, consider if they are self-employed; how anxious they may be to get back to work. This can be difficult for the physiotherapist to manage, as often rest from work is needed after a traumatic accident, especially if is manual work. Support organisations such as the Citizen's Advice Bureau can provide practical advice to patients at this time.
- It is important to understand what a patient's job, duties and hobbies comprise so that they can be advised about when they can return to them safely. It is important to find out how regularly the patient performs any activities, particularly sports and if they have any big events coming up, such as a competition or a social event like a wedding, as this

information may provide an insight into the patient's motivation.

Body chart

- A body chart is used to chart the patient's signs and symptoms (refer to chapter 13, Figure 13.1).
- It is important to record the signs and symptoms on the first attendance, so that improvement or deterioration can be monitored. If you already have a diagnosis from the medical team then the body chart can also help you to pick out any areas of abnormal presentation that do not fit the expected clinical picture.
- Remember to tick areas that are symptom-free to get the full picture.
- The body chart can be used to record special questions, for example, with a knee injury, whether it is locking or giving way, and mark on the chart any positive or negative responses.

Hypothesis formation

- The questioning should provide answers that assist the physiotherapist build a hypothesis about a patient's problems. The information will help determine the severity of the symptoms, the irritability and nature of the problems.

Objective assessment

- The objective assessment should be used to confirm or disprove the hypothesis and should be planned with this in mind.
- Having completed the subjective assessment, the patient will need to be appropriately undressed to enable affected areas to be seen clearly.

Observation

- Observe the patient's posture, the way that they are moving and the way they are holding the injured body part. Consider the patient generally before looking more closely at specific areas.
- Is the patient wearing a brace, sling or Tubigrip correctly.
- Look at the soft tissues.
  - Is the area swollen?
  - If so where?
  - Is there bruising or redness?
  - If so where?
  - If the skin is red, is it associated with a wound?
  - If a wound is present, is it dressed and can this be removed?
  - Are stitches still in situ? (consider if the redness and swelling is due to inflammation

or infection).

- When noticing these things, it is important to think about why they are there. Does it tie in with the method of injury, diagnosis or with the surgery that they have had? If it does, then it may limit the amount of assessment the patient can tolerate.
- Is there any noticeable deformity. If it is an acute injury, then a brief assessment may be warranted before the patient is referred for further investigations, such as an X-ray or scan.
- Deformity may be present post medical intervention, but has been examined and is determined not to be detrimental to their function. This is often the case with a distal radius fracture in the elderly, where they are managed conservatively in a cast and have a deformity after the fracture is healed. The patient usually returns to full pain-free function despite this.

Palpation

- Patients can often be nervous of having their injured limb handled, due to pain and anxiety that the injury may be made worse. It is important to warn a patient prior to palpating their affected body part and obtain their consent; it is part of the process of the patient learning to trust their therapist.
- Start the palpation by using the back of the hand to feel the affected area. This allows perception of any increased temperature and swelling in a way that looks less provocative from the patient's perspective. It will indicate how much pain the patient gets on light palpation, which will guide further handling during the assessment.
- Patients can be given a VAS scale to show how much pain they feel during palpation (Wewers & Lowe 1990). If they are in no or minimal pain, then firmer palpation may be tolerated, to enable identification of the injured tissues, swelling, and any deformity that is not evident on observation alone.

Precautions

- Having observed and palpated the area, ensure that there are no obvious limitations to the patient's ROM, or specific instructions from a surgeon, e.g. following a proximal fracture of the humerus a patient has been told they can lift their arm to shoulder height (90° flexion and abduction). The physiotherapist should not consider assessing the full range into elevation, due to the stress this will place on the fracture site.
- In the cases where the patient is strictly non-weight bearing, it may be inappropriate to assess the patient's muscle strength, as this may overload the joint or fracture.
- Assessment planning should take into account these types of issues. This may mean that the planned assessment may be limited, e.g. to assess ROM, respecting the patient's pain, following postoperative instructions or respecting inflammation around the joint.
- It is better to assess less and maintain the patient's confidence, than to assess too much and cause the patient unnecessary pain, which could detrimentally affect the therapist–

patient relationship. There should always be the opportunity to get the patient back in, to continue the assessment.
- It may be necessary to give the patient instructions about rest, ice, NSAIDs and get them to return when inflammation has been reduced.

Range of movement

- The following information should be noted during the assessment of active and passive joint movement:
  - The quality of the movement
  - The range of movement
  - The presence of resistance through the range of movement and at the end of the range of movement
  - Pain behaviour (local and referred) through the range
  - The occurrence of muscle spasm during the range of movement (Petty 2006).
- This information should confirm that structures are damaged, or whether they are tight or lengthened, weak or overactive. This will help you to build a clinical picture of what is causing the patient's symptoms. The use of passive ROM and gentle overpressure (if end range is achievable) can be used if the patient's symptoms are not severe and irritable, to assess the integrity of the soft tissues, especially ligaments (Hengeveld and Banks 2005).

Muscle testing

- After any injury the muscles are likely to become weak or tight, usually due to immobilisation in casts or braces or due to pain. It is important to note the strength in inner, middle and outer range, to determine specific functional weakness and to enable treatment to target the specific needs of the muscles.
- Muscle length is often affected post injury, and can cause biomechanical problems, leading to prolonged pain and decreased function.

Neurological testing

- Diagnostic neurological testing will be required if the patient has nerve injuries caused by specific fractures, burns or lacerating trauma.
- After prolonged immobilisation the mobility of the nervous system can become reduced in the injured area, which can cause neurogenic symptoms. Testing neurodynamics will provide diagnostic information about the problems being encountered by the neural tissue (Petty 2006).
- If a patient presents with neurological symptoms it is important to know why this is happening. A patient may be getting paraesthesia (pins and needles) if their cast is too tight, which will need to be referred to the plaster room as soon as possible.
- Alternatively they may have skin numbness around their wound, where a superficial

cutaneous nerve has been cut during surgery.

- It is also important to bear in mind that paraesthesia distal to a very swollen and inflamed joint, may be due to the nerves being compressed. It is essential that nerve compression is reduced as soon as possible.
- In the case of compartment syndrome, rapid surgery is required to release tight fascial compartments. Conditions such as deep vein thrombosis (DVT) will also need immediate medical attention.
- Nerve palsies are common with injuries such as humeral shaft fractures, and Achilles tendon ruptures. The presentation will vary from patient to patient, so a detailed neurological assessment will be required to map the extent of the injury.
- Refer to the assessment of nerve damage in Chapter 4.

Joint integrity tests and special tests

- There are a number or joint integrity and special tests for each joint, e.g. Lachman's test for anterior cruciate ligament instability. These tests are useful for diagnosing soft tissue injuries.
- With an acute injury it can be difficult, if not impossible, to perform some of these tests due to the patient's pain, swelling or muscle spasm.
- Manage the acute signs and symptoms and bring the patient back to continue the assessment once pain and swelling have reduced.

Accessory testing

- Accessory movements can be used to assess the articular structures, generally after the acute phase. They can assess hypomobility or hypermobility, and pain presenting throughout the range of joint motion (Maitland et al, 2005).

Gait

- Patients need to be able to mobilise safely at all stages of their treatment and will require guidance about how to progress to walking unaided with a reciprocal gait pattern.
- Some considerations that need to be noted during gait assessment are listed in Table 17.5.

Table 17.5 Gait pattern, observations and considerations

Gait pattern	Observation and questions
Non-weight bearing with frame or crutches	Are they coping with their walking aid – are they safe?
	Posture – is their trunk flexed – are their crutches/frame the right height?
	Are they hopping through too far?
	Do they need to non-weight bear? Are they in too much pain or too afraid to weight bear?

Partial weight bearing – 50% with frame or crutches	Are they putting the right amount of weight through their limb? This can be checked by weighing the patient and then checking them weight bearing through the scales
	Are they using heel–toe gait pattern? If not, why not? Can you correct this?
	Are they supposed to be using a boot? Or would they benefit from more support from a brace to their knee or ankle?
Full weight bearing with crutches	See above
Full weight bearing without aids	Do they have an antalgic gait? Do they need to be using a crutch on the contralateral side or two crutches to improve this?
	Do they have a Trendelenburg gait?
	Do they have a leg length discrepancy or a drop foot?

Psychological assessment

- In the assessment and treatment of trauma patients there may be the presentation of emotions such as anger, frustration and depression at any stage in their management.
- It is important to listen to the patient, and involve specialists in the management of psychological issues for advice.
- Refer to Chapter 16 for additional information on the management of the psychological effects of trauma.

Treatment planning

- Following the assessment, the treatment plan can be agreed with the patient and appropriate treatment goals and targets can be established.
- Problem-orientated medical records or SOAP formats are commonly used for identifying goals and indicators that can be used to monitor progress.

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Chapter 17

E-materials

Author profile

Anna Vines BSC(Hons) MCSP

Anna has worked in trauma rehabilitation for 5 years and has been team leader in the Trauma Physiotherapy Outpatients department at the John Radcliffe Hospital in Oxford since 2008.

In addition to managing a clinical case load Anna's current role involves attending trauma clinics, maintaining an efficient liaison with the inpatient trauma team and linking with physiotherapy outpatient departments in Oxfordshire and the surrounding counties.

Warren Sheehan BPhty MCSP

Since graduating from the University of Queensland, Australia, in 2000, Warren spent two and a half years working at the Gold Coast Hospital where he completed a large range of rotations. The next two years led Warren to England where he mixed in some travelling and working until he reached Oxford where he has been working since 2004. In 2006 Warren became part of the trauma team at the John Radcliffe Hospital and is based in the Trauma Inpatients Unit.

Case Study 17.1

Patient

- Alan a forty-two-year-old male, who works as an electrician.
- Inverted his ankle whilst playing 5-a-side football and sustained a Weber B ankle fracture.

HPC

- Initially the injury was treated conservatively in a below knee cast to be non-weight bearing for 6 weeks until his fracture clinic appointment.
- In fracture clinic he had the ankle re-X-rayed, which showed an appropriate amount of callus formation and therefore the cast was removed.
- He was seen by the physiotherapist in the fracture clinic for his initial appointment.
- The referral from the trauma doctor stated that the patient was permitted to weight bear as tolerated in a walker boot and was allowed to be treated to achieve full range of movement.
- The boot was to be retained and gradually removed after 2–3 weeks.

Assessment

Social history

- As a self-employed electrician Alan was keen to get back to work as soon as possible, as he has had been receiving no income since the injury.
- He was also keen to return to playing 5-a-side football, which was central to his social life outside of work.

PMH and DH

- Alan had high blood pressure, managed with medication (Lisinopril).
- He had no other conditions, no contraindications or precautions that should be taken into account, e.g. cancer or osteoporosis.
- He had no history of previous injuries to the ankle or any other relevant fractures.

Objective assessment

Observation (OBS)

- Alan was seen initially non-weight bearing with two elbow crutches.
- He was not keen to rest the foot on the floor during the subjective examination.
- The foot was found to be swollen, slightly red and covered in dry skin.
- There was slight tenderness around the lateral malleolus and the whole foot was warm.

Active range of movement (AROM)

- Alan was reluctant to move his ankle and complained of pain on all active ankle movements.
- Dorsiflexion was limited to plantargrade, plantar flexion, inversion and eversion movements were minimal.

Analysis

- Alan was anxious about moving his ankle and about using it generally.
- At this point the assessment was finished as it was considered important to get Alan working on some mobility exercises, improving his gait and to show him how to manage the swelling and dry skin at home.

Treatment

- A walker boot was fitted and Alan was taught a heel–toe gait pattern with the two elbow crutches weight bearing as tolerated.
- Reassurance was given that the fracture was healing and that it was strong enough to walk in the boot.
- At this stage the exercises were non-weight bearing.
- AROM exercises were begun.
- Active assisted ROM exercises with a towel to assist the movements of dorsiflexion, inversion and eversion were taught.
- Sitting over edge of the bed, heel–toe exercises, ankle dorsiflexion stretches and toe

curling were also taught.

- Alan was taught how to use ice or contrast baths and elevation to control the swelling.
- Advice was given about the use of moisturiser and soaking, to help with the dry skin.
- Alan was warned that the ankle would swell and be painful as he began using it more. The need to take painkillers was emphasised.
- This advice may need to be followed for several months post injury.
- Alan was concerned about getting back to work and he was advised to seek help, making an appointment with the Citizens Advice Bureau, to help him manage his finances, whilst rehabilitating.

Management

- Alan has weaned from the boot over a 2-week period.
- He progressed to exercises in standing, with dorsiflexion stretches, calf stretches, single leg stand work and calf raises.
- The ankle ROM, muscle strength, knee to wall and single leg stand were monitored to ensure appropriate progression.
- Maitland's and Mulligan's mobilisations were introduced to improve dorsiflexion along with soft tissue mobilisation to the calf.
- Alan was referred into a lower limb class to introduce more demanding exercises and to provide the added confidence he needed prior to returning to work and eventually his sport.
- Alan was able to return to work at 13 weeks post fracture, gradually increasing the workload.
- He continued to attend as an outpatient to enable a return to football.
- It was decided that it was appropriate for him to return to football once he could stand on the leg using a balance board to ensure that his balance, strength and proprioception were sufficiently developed to cope with the demands of football.
- His running gait was rehabilitated which included cutting and jumping.
- He was advised to do some training prior to playing in order to regain his general fitness.

Case Study 17.2 Acute trauma preoperative management

Background

- Tom, 36 years, lives with wife in two-storey house.
- He works as an engineer.
- Plays football.

- House has one step at the front door, spare room with en suite downstairs that he can live in.
- No regular medication.

Admission

- Admission to the trauma unit followed a road traffic accident in which he suffered a (R) midshaft femur fracture, a (L) tibial shaft fracture and a (R) chest injury consisting of rib 3 to 6 fractures and a pneumothorax.
- He was admitted via the accident and emergency department, where they inserted a chest drain.
- A CT of the body revealed no other injuries.
- From the notes prior to seeing the patient, the information gathered for the subjective examination was as follows.

Relevant past medical history (from medical notes)

- Previous (R) ankle fracture ORIF from which he recovered fully.
- Asthma, controlled by Ventolin.
- Smokes 5 cigarettes per day.
- Otherwise fit and well.

Assessment

- X-rays of lower limb fractures were described as:
  - Closed oblique fracture of the middle third of the (R) femur with 50% lateral displacement
  - Closed extra-articular multifragmented fracture of the distal third of the (L) tibia.

Preoperatively

Day 1 assessment

- Bedrest (L) leg in a backslab elevated on a Braun frame and (R) leg in skin traction.
- Chest drain had drained 500 mL.
- Auscultation revealed reduced breath sounds in the (R) middle and lower lobe.
- He was breathing 2 L oxygen via nasal prongs and his saturations were 98%.
- Coughing and deep breathes were painful ++.

- He was prescribed paracetamol and codeine.
- He reported no numbness or altered sensation and had full power of all joints that were able to be assessed.
- The (R) ankle and toes were the only joints to be tested as leg was in skin traction; (L) hip and knee were able to be tested, but ankle in backslab.
- All skin colour, pulses and capillary refill were normal on testing.
- He had full AROM of his upper limbs, (L) hip and knee and his (R) ankle.
- Using the overhead ring, he was able to lift his bottom and shift himself around the bed, but this was very painful.

Problem list

- Pain preventing patient from breathing properly and clearing secretions; shifting himself around the bed.
- At high risk of chest deterioration due to pain, rib fractures, pneumothorax, bed rest, possible fat emboli (especially due to femoral fracture) and past medical history of asthma and smoking.
- High risk of circulatory complications such as DVT.
- High risk of muscle weakness, tightness and reduced general fitness from bed rest and immobilisation of lower limbs.
- Risk of pressure areas from immobilisation, skin traction and backslab.

Treatment

- Pain management was the key treatment on day 1.
- The acute pain service started him on a PCA with a background dose.
- The patient was encouraged to use it as much as needed, particularly prior to physiotherapy.
- Chest physiotherapy consisted of deep breathing exercises, cardiovascular exercises, e.g. upper limb and general movement in the bed to encourage chest expansion and increased tidal volumes.
- A cough cushion was provided which the patient was encouraged to use for coughing, sneezing or moving in bed.
- AROM exercises for upper limbs were encouraged. Theraband was provided with a strength maintenance program.
- Pain initially prevented (R) shoulder ROM, so patient was taught AAROM exercises.
- (L) lower limb exercises consisting of AROM exercises for hip, knee and toes IRQ and (R) ankle AROM and stretches using a bandage were encouraged.
- Isometric gluteal and quadriceps contractions, (R) ankle df/pf and fl/ext (L) toes (FATS) were taught.
- The patient was encouraged to regularly relieve pressure by lifting his bottom.
- Exercises were advised to be done hourly and were written down as a reference for the patient.

Day 2

Assessment

- Chest drain was removed and chest X-ray showed a re-inflated (R) lung.
- Patient was using the PCA well and his pain was well controlled.
- There was an improvement in breath sounds in (R) middle lobe.
- Patient was managing all exercises well.

Treatment

- Chest treatment from day 1 and exercises reviewed.

Days 3–5

Assessment

- Pain controlled with PCA.
- Breathing had improved with breath sounds audible throughout all lung fields.
- He was breathing room air and saturations were 97%.
- He could perform a moderately strong dry non-productive cough.
- (R) calf muscles had become slightly tight due to the foot resting in plantarflexion.

Treatment

- Chest treatment.
- All exercises.
- Passive stretches of (R) ankle into DF, avoiding disturbance of skin traction or pain in (R) femur.
- A foot drop splint was applied at night to regain plantigrade at the ankle.
- From the patient's injuries it was foreseen that he would be bilaterally non weight bearing, so a wheelchair was ordered before his operations.
- Bilateral elevated foot rests were also ordered to elevate the (L) ankle and support the (R) knee.

At this point Tom was deemed ready for surgery as the oedema had subsided.

Case Study 17.3 Acute trauma postoperative management

Background

- Tom, 36 years, lives with wife in two-storey house.
- He works as an engineer.
- Plays football.
- House has one step at the front door, spare room with en suite downstairs that he can live in.
- He suffered a (R) midshaft femur fracture, a (L) tibial shaft fracture and a (R) chest injury consisting of rib 3 to 6 fractures and a pneumothorax as a result of an RTA.
- He was managed for 5 days preoperatively whilst swelling in the affected limbs subsided sufficiently for surgery to be undertaken.
- During the 5-day pre-operative period the occupational therapist had began the home set up, including bringing a bed downstairs as Tom was prohibited from climbing stairs for 6 weeks.
- A ramp was organised for the front door as he would be in a wheelchair when discharged home.

Operation

- Tom was operated on day 5 post injury.
- The following operations were carried out and their postoperative instructions were:
  - Antegrade intramedullary nailing of the (R) femur:
    a. Non weight bearing for 6 weeks
    b. No restrictions on movement
    c. No cast needed
  - ORIF of the distal (L) tibia using a bridging plate.
    a. Non weight bearing for 6 weeks
    b. Full movement of ankle allowed once wounds dry
    c. Exchange backslab for a lightweight, removable below knee cast.

Days 6 and 7 (Days 1 and 2 post operative)

Assessment

- Tom's respiratory function was assessed as he had undergone a general anaesthetic.
- He had decreased breath sounds bibasally.
- He was breathing room air with his saturation being 97%.
- His cough was dry and non-productive.
- All observations were normal.
- He remained on the PCA and pain was well controlled.

Treatment goals

- Monitor chest for deterioration due to preoperative trauma and now postanaesthetic.
- Improve ROM and strength of lower limbs (wound healing required before starting (L) ankle ROM).
- Arrange new cast for (L) ankle.
- Independent transfers and W/C mobility (bilaterally NWB for 6 weeks).
- Plan for discharge home.

Treatment

- Chest treatment.
- (R) AAROM exercises with sliding board. Tom able to achieve 35° hip and knee flexion and 15° hip abduction. He had full ankle ROM.
- (L) hip and knee AROM and strength maintenance exercises were continued.
- Ankle exercises were not yet permitted.
- A removable below knee cast was ordered from the plaster room.
- Tom began active knee ROM and strengthening exercises in sitting.
- Being young and healthy, Tom was able to sit over the edge of the bed for a substantial period of time and was keen to transfer to the wheelchair.
- He was taught how to slide transfer between bed and wheelchair via a transfer board, initially with 3 physiotherapy team members assisting to reduce the risk of falls.
- Tom was able to transfer with assistance of one person to assist with his legs.
- Safe wheelchair operation was taught and he quickly learnt how to mobilise around the ward.
- A CPM was applied to the (R) leg in bed.
- The occupational therapist oversaw the fitting of the ramp at Tom's home and a commode was ordered as his wheelchair would not fit into the toilet downstairs.

Day 8

- Wounds were all reviewed and reported as clean and dry.
- Doctors were happy for movement to begin in the (L) ankle and the plaster technicians applied the lightweight removable cast.

Assessment

- Chest clear, equal breath sounds throughout with 98% saturations on room air.
- (L) lower limb:
  - Hip and knee: full AROM with full power
  - Ankle: DF 0°; PF35°; INV 5°; EV 0°. Swelling around foot and ankle.
- (R) lower limb:
  - Hip: F 95°; Abd 25°; ER/IR normal; power 3+/5
  - Knee: F 95°; E 0°; power 4/5

    - Ankle: full AROM and power.
- Transfers
    - Independent sitting over side of bed
    - Independent at positioning transfer board
    - Independent at slide transfers between bed and W/C
    - Independent W/C mobility.

Treatment

- Tom was encouraged to continue breathing exercises, educated about signs and symptoms of chest deterioration and advised to report back to A&E if any of these occurred.
- AROM and strength exercises were shown for (R) hip, knee and ankle and (L) hip and knee.
- AROM and AAROM exercises were shown for the (L) ankle to encourage DF, INV and EV.
- All exercises were written down as a home exercise programme and advice was also given on how to maintain general fitness whilst in the wheelchair for 6 weeks.

Day 9

- Equipment was delivered to his house and he was discharged.
- An outpatient referral was completed and sent by fax to his local outpatient department for him to continue his rehabilitation.

Chapter 17 Trauma orthopaedic multiple choice questions

1. Which of the following would not be included with the initial referral?
    a). The patient's telephone number
    b). A full copy of the patient's medical notes
    c). The post op notes for this admission
    d). The physiotherapy protocol for the patient's injury
2. Which outcome measure would be most appropriate for a patient presenting for physio following conservative management of a burst fracture of L1?
    a). LEFS
    b). DASH
    c). ODI
    d). NDI
3. Which of the following may contribute to a delayed recovery?
    a). Compensation claim
    b). Overprotective family
    c). Anxiety and/or depression

d). All of the above

4. Which of the following does not require immediate medical attention following an outpatient assessment?
   a). Deep vein thrombosis
   b). Grossly infected wound
   c). Severe pain levels
   d). Recent alteration of bladder function
5. Which of these objective measures would be chosen to assess ankle dorsiflexion after an ankle fracture?
   a). Gait pattern
   b). Knee to wall
   c). Single leg stand
   d). Single leg heel raise
6. What intervention would be avoided while a patient is strictly touch weight bearing after an acetabular fracture?
   a). Muscle strengthening
   b). Gait re-education
   c). Active range of movement exercise
   d). Soft tissue mobilisation
7. What is least likely to cause permanent loss of range of movement after an intra-articular distal radius fracture, managed with a volar plate?
   a). The fracture type (intra-articular)
   b). The presence of the plate
   c). Joint hypomobility
   d). Pain
8. Which of the following does not tend to benefit from soft tissue mobilisation?
   a). Joint hypermobility
   b). Muscle shortening
   c). Joint swelling
   d). Muscle weakness
9. Which of these exercises would be best for retraining joint proprioception in the shoulder following a dislocation?
   a). Rotator cuff strengthening
   b). Press ups against a wall
   c). Scapula setting
   d). Range of movement exercises
10. Which of the following is not a symptom of complex regional pain syndrome?
   a). Redness
   b). Hair growth
   c). Brittle nails
   d). Potent odour
11. Which of the following fractures would most likely have a postoperative instruction of

touch weight bearing?

a). Ankle fracture

b). Total hip replacement

c). Acetabular fracture

d). Tibial plateau fracture

12. Which symptom is not a sign of compartment syndrome?

a). Pain

b). Increased temperature

c). Paraesthesia

d). Decreased pulses

13. Which of the following is NOT a principle of fixation?

a). Ensure fracture is anatomically reduced

b). Preserve soft tissue when fixing fracture

c). Immobilise affected joint to allow fracture to heal

d). Stabilise fracture to allow healing

14. Which one of the following imaging techniques would be most useful in assessing a meniscal tear?

a). X-ray

b). Ultrasound

c). CT

d). MRI

15. Which of the following type of injuries is least likely to contribute to a neurological injury?

a). Undisplaced tibial plateau fracture

b). Midshaft humeral fracture

c). Acetabular fracture

d). Head injury

16. Which of the following methods of fixation would lead to absolute stability of the fracture?

a). External fixator

b). Locking plate and locking screws

c). Kirschner wires

d). Compression plate and screws

17. Which of the following would not delay healing of a fracture?

a). Smoking

b). Diabetes

c). Infection

d). Obesity

18. Which of the following treatment options should be avoided with a patient who has sustained an acetabulum injury?

a). Inner range quadriceps exercise

b). Gait re-education

c). Straight leg raise
d). Active range of motion of the hip joint

19. Which of the following fixations limit early range of motion?
    a). Kirschner wires of the distal radius fracture
    b). Tension band wiring of the patella fracture
    c). External fixation of a tibial shaft fracture
    d). Compression plating of a radial shaft fracture
20. Which of the following best describe a 2-part fracture, not in continuity?
    a). Multifragmented
    b). Angulated
    c). Displaced
    d). Spiral

Trauma orthopaedic multiple choice answers

1. b)
2. c)
3. d)
4. c)
5. b)
6. a)
7. b)
8. a)
9. b)
10. d)
11. c)
12. b)
13. c)
14. d)
15. a)
16. b)
17. d)
18. c)
19. a)
20. c)

The Concise Guide to Physiotherapy - Volume Two

Treatment

Tim Ainslie, MSc GradDipPhys MCSP MMACP
Clinical Education Co-ordinator/Senior Lecturer, Physiotherapy Programme, Oxford Brookes University, Oxford, UK

Churchill Livingstone

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Contributors

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Contributors

Anne Alexander, MSc BSc(Hons) MCSP MMACP
Clinical Specialist Physiotherapist, Hand Therapy and Plastic Surgery Department, John Radcliffe Hospital, Oxford

Chapter 4 – Burns and plastic surgery

Rebecca Aston, MA MCSP
Specialist Women's Health Physiotherapist, Community PFD Service Team Lead, Homerton Hospital, London

Chapter 11 – Obstetrics and gynaecology

Kate Baker, BSc(Hons) MCSP
Macmillan Cancer Lead Physiotherapist, Velindre Cancer Centre, Cardiff

Chapter 12 – Oncology and palliative care

Louise Briggs, MSc BSc(Hons) MCSP
AHP Therapy Consultant – Acute Rehabilitation St George's Health Care NHS Trust, London

Chapter 7 – Gerontology

Joanna Camp, BSc(Hons) MCSP
Specialist Physiotherapist, National Spinal Injuries Unit, Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust

Chapter 16 – Spinal cord injuries

Maureen Carter, BA MCSP
Retired Senior Physiotherapist in Community and Intermediate Care, Croydon, Surrey

Chapter 6 – Community physiotherapy

Jackie Clifford, MSc BA Cert. Management GradDipPhys MCSP
Self Employed Rehabilitation Consultant Worthing, West Sussex

Chapter 10 – Mental health

Mary Jane, Cole MSc GradDipPhys MCSP ACE
Senior Lecturer, Practice Education, Kingston University and St George's University, London

Chapter 2 – Amputee rehabilitation

Karen Edwards, MSc MCSP
Clinical Specialist Physiotherapist Great Ormond Street Hospital, London

[Chapter 5 – Community paediatrics](#)

Carole Fruin, GradDipPhys Cert. Rheum. Practice MCSP
Clinical Specialist Physiotherapist – Rheumatology, South London Healthcare NHS Trust, London

[Chapter 15 – Rheumatology](#)

Kerry Gibson, BSc(Hons) MCSP
Senior Physiotherapist Birmingham & Solihull Mental Health NHS Foundation Trust, Birmingham

[Chapter 10 – Mental health](#)

Susie Grady, MSc BSc(Hons) MCSP
Aquatic Therapy Team Leader, The Gardens and Jacob Centres, Hertfordshire

[Chapter 3 – Aquatic physiotherapy](#)

Beverley Greensitt, BSc(Hons) MCSP
Senior Physiotherapist, John Radcliffe Hospital, Oxford

[Chapter 9 – Medicine](#)

Caroline Griffiths, GradDipPhys MCSP
Professional Lead, Physiotherapy, Oxford Health NHS Foundation Trust, Oxford

[Chapter 10 – Mental health](#)

Vicki Harding, PhD MCSP
Research and Clinical Specialist Physiotherapist, INPUT Pain Management Programme, St Thomas' Hospital, London

[Chapter 13 – Pain management](#)

Nicola Harmer, GradDipPhys MCSP
Highly Specialist Physiotherapist/Directorate Manual Handling Advisor Directorate of Learning Disability Services, Abertawe Bro Morgannwg University Health Board

[Chapter 8 – Learning disabilities](#)

Scott Hawthorne, BAppSc MCSP MAPA
Band 7 Physiotherapist, Acute Spinal Injuries Physiotherapy Lead, national Spinal injuries Centre, Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust

[Chapter 16 – Spinal cord injuries](#)

Andrea Hounsell, MSc BSc(Hons) MCSP
Physiotherapy Team Leader, Directorate of Learning Disability services, Abertawe Bro Morgannwg University Health Board

[Chapter 8 – Learning disabilities](#)

Julia Hyde, MCSP BSc(Hons)
Children's Community Physiotherapist, Oxford Health NHS Foundation Trust, Oxford

Chapter 5 – Community paediatrics

Anne Jackson, PhD MSc BA(Hons) MCSP
English Networks Programme Manager, Chartered Society of Physiotherapy, London

Chapter 3 – Aquatic physiotherapy

Deborah Jackson, MSc BSc(Hons) MCSP
Clinical Specialist Physiotherapist, Great Ormond Street Hospital, London

Chapter 1 – Acute paediatrics

Captain Mark Jenkins, MSc BSc(Hons) MCSP RAMC
Officer in Command, Primary CareRehabilitation Facility, Wellington Barracks,London

Chapter 14 – Rehabilitation

Lesley Katchburian, MSc MCSP
Clinical Specialist Physiotherapist (Neurodisability), The Wolfson Neurodisability Service, Great Ormond Street Hospital, London

Chapter 1 – Acute paediatrics

Jane Leathwood GradDipPhys, MCSP
Senior Physiotherapist Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust

Chapter 4 – Burns and plastic surgery

Karen Livingstone, MCSP GradDipPhys
Clinical Specialist Physiotherapist in Oncology and Palliative Care, St Ann's Hospice, Neil Cliffe Centre, Wythenshawe Hospital, Manchester

Chapter 12 – Oncology and palliative care

Marion Main, MA MCSP
Dubowitz Neuromuscular Centre, Great Ormond Street Hospital, London

Chapter 1 – Acute paediatrics

Mike Maynard, GradDipPhys HT
Clinical Lead in Aquatic Physiotherapy, United Lincolnshire Hospitals

Chapter 3 – Aquatic physiotherapy

Aileen McCartney, MSc BSc(Hons) MCSP
Senior Physiotherapist, Specialist Palliative Care, Wisdom Hospital, Rochester, Kent

Chapter 12 – Oncology and palliative care

Doreen McClurg, PhD MCSP
Reader, NMAHP Research Unit, Glasgow Caledonian University, Glasgow

[*Chapter 11 – Obstetrics and gynaecology*]

Lorraine Moores, MSc GradDipPhys MCSP
Principal Physiotherapist, Manchester and Salford Pain Centre, Salford Royal Hospital NHS Foundation Trust, Salford

[*Chapter 13 – Pain management*]

Venkataramanan Narayanan, MSc BSc(Hons) MCSP
Senior Physiotherapist, Oxford Health NHS Foundation Trust, Oxford

[*Chapter 10 – Mental health*]

Clare Nickols, MSc BSc(Hons) MCSP
In-Patient Team Leader/ Deputy Physiotherapy Manager, Heatherwood Hospital, Ascot, Berkshire

[*Chapter 9 – Medicine*]

Jayne R. Nixon, BSc(Hons) Dip Sport Ex Med MCSP
Clinical Specialist and Clinical Lead – Lower Limbs Team, Defence Medical Rehabilitation Centre, Headley Court, Epsom, Surrey

[*Chapter 14 – Rehabilitation*]

Pauline Norris, MCSP
Senior Children's Physiotherapist OxfordHealth NHS Foundation Trust, Oxford

[*Chapter 5 – Community paediatrics*]

Siobhan O'Mahony, PGDip Health Services Management GradDipPhys MCSP
Physiotherapy Manager, St Patrick's Hospital (cork) Ltd, Cork, Ireland

[*Chapter 12 – Oncology and palliative care*]

Ankie Postma, GradDipPhys
Band 7 Amputee Rehabilitation, Aquatic Physiotherapy and Ankylosing Spondylitis Basildon Hospital, Essex

[*Chapter 3 – Aquatic physiotherapy*]

Davina Richardson, MSc BSc(Hons) MCSP
Clinical Lead Therapist, Neurosciences, Imperial College Healthcare NHS Trust, London

[*Chapter 14 – Rehabilitation*]

Karen A J. Rix, MSCP GradDipPhys
Clinical Team Leader, Community Intermediate Care Servie, London

Chapter 6 – Community physiotherapy

Andrew Rolls, MSC BSC(Hons) MCSP
Head of Sports Medicine, West Ham United Football Club, London

Chapter 14 – Rehabilitation

Josie Scerri, BSc(Hons) MCSP
Senior Physiotherapist, Neurodisability Service, Great Ormond Street Hospital, London

Chapter 1 – Acute paediatrics

Warren Sheehan, BPhty MCSP
Senior Physiotherapist, John Radcliffe Hospital, Oxford

Chapter 14 – Trauma orthopaedics

Alison Skinner, FCSP Dip TP HT BA
Consultant Aquatic Physiotherapist/Physiotherapy Educator, London

Chapter 3 – Aquatic physiotherapy

Sara Smith, GradDipPhys PGCertClinEd MCSP
Amputee Therapy Team Leader, Rehabilitation Gym, Douglas Bader Centre, Queen Mary's Hospital, London

Chapter 2 – Amputee rehabilitation

Sue Standing, MSc MCSP
Lead Physiotherapist, Hampshire Partnership Foundation Trust, Southampton

Chapter 8 – Learning disabilities

Robyn Stiger, MSc BSc(Hons) MCSP
Associate Lecturer, Oxford Brookes University, Oxford

Chapter 1 – Acute paediatrics

Catherine Stringer, BSc(Hons) BEd MCSP
Senior Musculoskeletal Physiotherapist/Hydrotherapy, Physiotherapy Department, Good Hope Hospital, West Midlands

Chapter 3 – Aquatic physiotherapy

Anna Vines, BSC(Hons) MCSP
Senior Physiotherapist, John Radcliffe Hospital, Oxford

Chapter 17 – Trauma orthopaedics

Yvonne Wren, GradDipPhys
Retired Clinical Therapy Lead for Intermediate Care, Southward, London; Retired Specialist Lecturer,

University of East London, London

Chapter 6 – Community physiotherapy

Preface

Students and graduate physiotherapists report feeling underprepared when entering an unfamiliar practice area for the first time. The core areas of musculoskeletal, neurology and cardio-respiratory tend to be covered in depth in the university as students are prepared for practice placements and it is often the 'non-core' areas such as burns and plastic surgery or palliative care that can cause a student to feel anxious and underprepared. Written by specialists from the 'non-core' areas of practice the two volumes of this book aim to provide the student or graduate with an insight into the philosophy of approach that needs to be taken in either the assessment (volume 1) or the treatment (volume 2) of the individual in these placement areas. The material provides an entry level of knowledge with the expectation that the reader will access more 'in-depth' information, in order to supplement the material provided in the two volumes and on-line resources.

Tim Ainslie

Chapter 1

Acute Paediatrics

Neuromuscular disorders

Treatment of children with neuromuscular disorders must be considered in the context of the child, the disorder and the family. These are life-long and many, life-limiting conditions, most of which will deteriorate over time. Many weak children will be prone to respiratory problems and repeated chest infections. Night time, sometimes day and night time ventilation, usually with BiPAP may be needed for survival.

The aims of management are

- Maximise useful function
- Improve or maintain quality of life
- Reduce the burden of care on parents and carers.

It is helpful to know the diagnosis to be able to anticipate problems but with the above aims in mind, treatment plans can be affected without a diagnosis if a neuromuscular disorder is suspected. Before being able to treat, an underlying knowledge of the major conditions is needed.

The most common neuromuscular disorders

- The largest group of neuromuscular disorders is the progressive muscular dystrophies: Duchenne muscular dystrophy (DMD), Becker muscular dystrophy (BMD, a milder form of DMD) and a group of childhood limb girdle dystrophies. The main features of these disorders are that ambulation is achieved in childhood but a large proportion of children will lose it before adulthood.
- Congenital muscular dystrophies (CMD): a wide spectrum of disorders characterised by weakness and severe and progressive contractures, which are a major cause of functional limitation. Depending on severity of the disorder, children may or may never walk, and those who walk may lose ambulation.
- The congenital myopathies: another diverse group of conditions, while there can be quite severe respiratory involvement in some types, they are much more slowly progressive than the dystrophies. Walking ability is variable as above.

- Spinal muscular atrophy (SMA) is a neurogenic disorder; a problem of the nerve impulses not reaching muscles. It is not considered progressive in childhood, but growth greatly affects function and development of scoliosis in non-ambulant children. Children with SMA are grouped into those with severe SMA (type 1) who never achieve independent sitting; moderate or type 2 SMA, who achieve independent sitting but not independent walking; type 3, mild SMA, who do walk, but may lose the ability before adulthood.
- Peripheral neuropathies: including the largest group, Charcot–Marie–Tooth syndrome, are slowly progressive disorders primarily affecting nerves and nerve sheaths and can interfere with lower arm and hand and lower leg and foot function. Almost all will walk into adulthood but need foot orthotics and possibly foot surgery. Foot pain is common. They tend to have weak hands and fatigue with writing.
- Arthrogryposis is the term used to describe children born with joint contractures. There are several causes, some with underlying neurogenic or neuromuscular origins. In some forms of CMD babies are born with contractures.
- Congenital myotonic dystrophy (DM1) is a relatively common disorder characterised by mild weakness, developmental delay, fatigue, and learning difficulties. The children have frequent incidence of talipes. The children should achieve ambulation.

Priorities of physiotherapy management

The priorities of management will depend on diagnosis and presentation of the varying disorders. Each disorder has a spectrum of disease with some children having more severe, rapidly progressive problems than others.

NB: in all cases, for children who have respiratory involvement, the primary aim of physiotherapy will be maintaining clear airways. When necessary, parents will be taught chest physiotherapy and secretion clearance techniques.

In some conditions, e.g. DMD, the course can be more predictable and therefore some problems, such as the development of contractures, can be anticipated and preventative measures tried.

Regular, comprehensive assessment is needed to assess the priorities of management at different stages as they will differ according to disorder, age, and difficulties.

When determining physiotherapy priorities it must be remembered that the family situation must be considered. Physiotherapy is only one small part of what the child needs and parents can do. Any programme must be given in context of the family as a whole. Medical considerations (medication, possible management of ventilation and/or gastrostomy), siblings, affected siblings and affected parents, school/nursery, housing/social problems all have to be taken into account.

It is not useful to assume that management strategies for DMD will work in SMA or Charcot–Marie–Tooth syndrome. Similarly it is not possible to extrapolate to neuromuscular disorders from neurological or musculoskeletal conditions.

Treatment objectives

- Maintain respiratory viability
- Improve or maintain power where possible
- Prevent or reduce contractures
- Encourage and maintain mobility
- Maintain symmetrical posture, where possible
- Prevent or reduce pain.

Respiratory management of the child with neuromuscular disorders

This is part of respiratory therapy and therefore not covered. It is important, however, when working with these children, in hospital or in the community to have knowledge of current respiratory management, appropriate positioning, contraindications to treatment, the use of equipment; ventilators (mostly Bipap), suction and cough-assist when necessary. Advice from a physiotherapist experienced in these areas is essential.

Improve or maintain power

The major problem in neuromuscular disorders is weakness. In some cases the muscle fibres or nerves are deteriorating so the weakness is progressive. In some conditions, the weakness is masked by increasing contractures, and in some the weakness does not increase but increases in height and weight will increase functional difficulties.

Weakness caused by deteriorating conditions cannot be improved, but in many cases, a proportion of weakness is caused by disuse atrophy; which can and should be treated.

- In the muscular dystrophies, increased muscle damage can be caused by using weights or repeated eccentric muscle work.
- Open chain exercise cannot be easily achieved by non-ambulant children.
- Asymmetry of power is extremely common; it is important to ensure exercise is tailored to produce symmetrical work.
- Muscle imbalance can be increased, with resultant increase in contractures if the exercise programmes do not target the correct muscle groups.

The weakest muscles

In many disorders the knee extensors, hip extensors and neck and trunk flexors are weak (Figure 1.1).

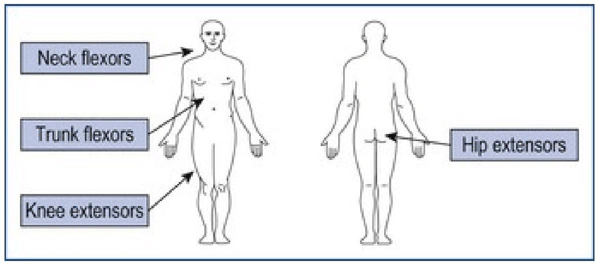

Figure 1.1 The weakest muscle groups.

The knee and hip extensors weakness causes the hyper-lordotic posture seen in DMD and other conditions (Figure 1.2a, b).

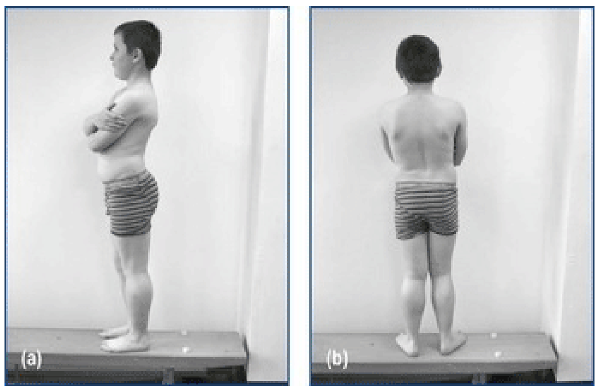

Figure 1.2 (a and b) Hyperlordosis caused by hip extensor weakness.

Due to the weakness of hip extensors, the hamstrings act as hip extensors and help to maintain the stability of the pelvis.

For this reason, hamstring stretches have no place in the management of most neuromuscular conditions.

Exercise and exercise programmes

Exercise programmes are frequently boring and rarely followed over time. Giving repetitive exercises to children will not be effective unless they are fun, varied and are seen to make a difference. In neuromuscular disorders it is frequently hard to see improvement, but it must be impressed on parents, carers and older children that no deterioration, particularly through growth spurts, is positive.

Exercises must be functional – they must target groups that make a difference. It is no good exercising stronger groups, increasing asymmetry or working on groups that ultimately are effective at increasing strength, but have no functional benefit.

Ideally, exercise should become part of daily routine like stretches. They must fit into daily activities, must be inexpensive and achievable. Aquatic physiotherapy, swimming (or

playing in the water), bicycling/tricycling, horse riding, martial arts, non-contact sports and wheelchair sports should all be encouraged.

Trampolining, scooters, gymnastics, rugby and weights (in most cases) are not advised.

Prevent or reduce contractures

Contractures are caused by lack of movement, increasing fibrosis of muscle, persistent poor positioning and muscle imbalance. They will not go away on their own! Contractures interfere with function, can prevent or reduce the attainment of the upright posture and therefore walking, can cause pain and make positioning still more difficult. Scoliosis is a form of contracture which can also limit chest expansion and further reduce the ability of the chest to expand on inspiration.

Contractures can happen at any joint including the jaw and neck but in many disorders they are common patterns of contractures or predictable development of tightness.

Stretches must be targeted only at those groups where the contractures interfere with function. There is no value in stretching hypermobile joints or joints where very mild contractures do not and will not cause difficulty.

The management of contractures can be effected in the following ways.

Stretching

Stretching should never be painful.

Stretches will not be effective if they are not done regularly, for a long enough time and if there is no way of supporting or maintaining the range of movement or increase gained.

Stretches should be active assisted where possible, should be done daily (or six times per week) and should be held long enough for the stretch to be effective. Stretches coupled with splinting are proven to be more effective than stretching alone.

NB, it is very easy to sprain the ankles of non-ambulant children with SMA when doing stretches and therefore caution is needed to prevent this happening.

Positioning

The use of positioning for stretch is highly effective, the most useful position being standing as it will stretch all lower limb joints. Standing is of no benefit if it increases asymmetry of posture.

Prone lying in a symmetrical position without the feet being compromised and long sitting (with gaiters in some conditions) are also effective.

Splinting

Night time Ankle Foot Orthoses (AFO) to maintain ankle range have been shown, when used with stretching, to be most effective at maintaining range. They also help to prevent long-term foot deformities in non-ambulant children (Figure 1.3).

Figure 1.3 Ankle foot Orthoses.

Knee splints and elbow splints can be used to maintain range during the day or at night. The use of splinting must be considered carefully and not cause functional limitation. Only one elbow splint at a time should be worn at night. Knee splints should not be worn with ankle splints.

The use of any splint worn at night which disturbs sleep or parents' sleep needs to be carefully evaluated. It must be remembered; a number of children will be using night-time ventilation and a few will wear spinal jackets at night. The use of other splints may not be possible and will need to be worn for periods during the day instead. Flexibility in approach is needed and discussion with parents and children as to how the differing demands can be best managed.

Serial casting

Serial casting is effective at improving range. It is important, however, that the following rules are followed.

1. Serial casting should never last more than 15 days.
2. Casting should never be painful.
3. The first cast is a resting splint, and will be the most effective.
4. When casting ankles in an ambulant child, both ankles must be cast, irrespective of whether both ankles are tight.
5. Ambulant children should always be able to walk in the casts.
6. Removable splints will need to be considered for elbows and knees if the casting interferes with function, sleep or mobility.

Surgery

In some cases the only way to reduce contractures will be to have surgical release. They must be considered very carefully with the whole team. The postoperative splinting needs to be carefully considered and ambulant children must be able to walk in plasters or be off their feet for no longer than 2 weeks.

Hip flexor releases will not last and recur within 9–12 months.

It is rarely useful to perform bony hip surgery on children with neuromuscular disorders. Dislocated hips are common and unless painful, causing problems with seating or preventing independent ambulation, surgery should not be considered.

Encourage and maintain mobility

The weaker the child, the less function they will have, but there are weak children who maintain ambulation and relatively weaker ones who are unable to walk.

Mobility needs to be considered as a whole and includes walking, independently or with splints/orthoses, manual and electric wheelchair mobility, dynamic standers, electric scooter, and bicycles/tricycles.

Some children will never achieve ambulation, some will achieve it and lose it, but the most important thing for the child is, whether they can walk or not, that they are able to move around and explore their environment, fully access their home, nursery/school and leisure facilities and if wheelchair-dependent, ensure transport for their wheelchair where needed.

The use of orthoses is common in neuromuscular disorders to achieve or maintain ambulation.

Maintain symmetrical posture

Almost all non-ambulant children with neuromuscular disorders will develop scoliosis. The age of onset, how severe and how rapidly it progresses varies in different disorders and different children. All children with type 2 SMA will develop scoliosis; many boys with DMD who lose ambulation will develop asymmetry.

Physiotherapy can help, along with other management strategies, to slow down the rate of progression by encouraging ambulation, through positioning, maintaining symmetry through exercise and stretches and ensuring good posture throughout the day.

As the deformity in neuromuscular disorders is caused by weakness, the children rarely need to have postural control when in bed.

Prevent or reduce pain

Direct pain is uncommon in children with neuromuscular disorders, although often reported as a symptom in adults. Pain is most frequently caused by injury, badly fitting splints, poor posture or seating, immobility causing stiffness or pressure, and stiff joints.

Boys with DMD who are taking steroids may complain of back pain. It may be persistent or caused by sudden or specific movements. This must always be taken seriously and the child referred to their paediatrician or GP.

Most pain can be prevented. The treatment of pain in these children is the same as in any other – first, remove the cause. Second, prevent it recurring.

Parental pain from poor manual handling or lack of equipment must also be considered

as a major problem in the home.

Revision

The aims of physiotherapy in these children are:

1. To maintain maximum useful function – including respiratory function.
2. Ensure no physiotherapy is painful.
3. Physiotherapy should be targeted and specific – it should be made to fit with daily routine, must be fun and seen to be beneficial.
4. It must not increase the burden of care.
5. Ensure that any care is done in the context of the family.

Musculoskeletal

- Most young children are unlikely to co-operate with a formalised exercise programme so the creative use of toys and play is needed to encourage the child to move and maintain their interest.
- The physiotherapist should spend more time teaching parents, carers and teaching assistants how to handle and position their child so that they can continue therapy outside the physiotherapy sessions.
- Support, reassurance, gaining consent to carry out treatment and dealing sensitively with often highly anxious parents all play a central role in paediatric physiotherapy.
- Being aware of wider influences such as religious beliefs, past experiences, as well as individual coping abilities is all part of successfully managing the child and their family.
- Young skeletons have the potential to heal and remodel rapidly, but muscle imbalance, injury to growth plate through trauma or infections (e.g. meningococcal septicaemia), and certain conditions (e.g. Blount's disease) may lead to asymmetrical growth and progressive deformity as the child grows.
- The treatment of common conditions, such as developmental dysplasia of the hip (DDH) and congenital talipes equinovarus (CTEV), combines this remodeling ability of the growing skeleton with an understanding of the laws governing the remodeling of bone, which state that by improving the biomechanical environment, abnormal growth patterns may be reversed–Heuter–Volkmann law (Rauch 2005).

Normal variants

- If the presenting problem is symmetrical, symptom-free, without stiffness or systemic involvement and there is no skeletal dysplasia (refer to 5 'S's' in assessment volume), it is probably a normal variant and requires no intervention.
- The most common causes of concern are in toeing, bowlegs (genu varus), knock-knees (genu valgus) and flat foot (planovalgus).

- The role of the physiotherapist in these conditions is to rule out anything more sinister and then monitor the child's development and functional abilities whilst reassuring the parents that they are likely to resolve as the child grows.

Abnormalities of the hip

Developmental dysplasia of the hip

- This term describes the spectrum of hip instability ranging from a shallow (dysplastic) acetabulum to the irreducibly dislocated hip.
- In the infant DDH may present as instability, in a toddler as a limp, and in an adolescent as exercise-induced pain.
- Conservative treatment is likely to be successful only if the diagnosis is made early.
- However, normal hips may be unstable at birth because of ligamentous laxity and stabilise within the first couple of weeks of life so require no treatment.
- The principles of treatment are the same at any age and, put simply are: 'Get it down, Get it in, Keep it in, Monitor'.
- Hips that remain unstable or are dislocated are treated with harnesses or splints which aim to hold the hip in its reduced position of abduction and flexion.
- The most commonly used splint is the Pavlik harness, which allows controlled movement.
- Often it is the role of the physiotherapist to apply the splint and, essentially, to monitor the baby closely whilst in the harness.
- The harness will need frequent adjustment as the child grows to reduce the risk of avascular necrosis and the parents will need to be advised to ensure their baby keeps kicking as failure to do so may indicate femoral nerve palsy.
- In infants over the age of 4–6 months, closed reduction is usually required and the hip held in a hip spica cast for some months.
- The older the child becomes, the less likely it is that reduction by closed methods will succeed and open reduction, together with bony realignment and hip spica application, is necessary.
- Open reduction becomes more difficult and less successful in the older child and so surgery is often not undertaken over the age of 6–8 years in bilateral cases and over 8–10 years in unilateral.
- Physiotherapy involvement in these children will include advising the parents on manual handling and positioning the child in the spica and providing information on suitable buggies/chairs/car seats.
- On spica removal, physiotherapy will be targeted at regaining range of movement and muscle strength and, depending on the age of the child, re-education of gait.
- Passive movement of the knee should be avoided due to the risk of supracondylar fracture but the child should be encouraged to move as normally as possible.

Legg–Calve–Perthes disease

This condition is characterised by the development of AVN of the proximal femoral epiphysis and, once established, follows a relatively well-defined path lasting 3–4 years. This entails collapse and fragmentation of the ossific nucleus of the femoral head followed by healing with revascularisation and regeneration of the bony epiphysis. Prognosis is generally good, particularly of young children and those with partial femoral head involvement. However, during the collapse and fragmentation stages, femoral head deformity occurs.

If a child between the ages of 4 and 8 years complains of aching or pain at the hip or knee, walks with a limp and shows reduced range of hip movement, Perthes disease should be suspected and X-rays requested to confirm this diagnosis.

The primary aim of physiotherapy in these children is to maintain range of movement (particularly hip abduction and extension) through stretches, active exercise and positioning. This will encourage sphericity of the femoral head and hence reduce the likelihood of secondary acetabular dysplasia. Sporting activity may be reduced, particularly those that stress the joint such as trampolining or contact sports, but the use of crutches and/or wheelchairs should be avoided because they promote the adducted and flexed posture that you are trying to avoid. Hydrotherapy is an excellent medium to increase range of movement without placing undue stress on the joint.

The role of operative treatment is controversial. Some surgeons prefer to perform surgery early to prevent deformity secondary to femoral head collapse whilst others advocate later intervention to correct deformity. Postoperatively, physiotherapy will be needed to mobilise and strengthen the limb and re-educate gait.

Slipped upper/capital femoral epiphysis (SUFE)

As this is a fracture through the physis it can be missed on X-ray until it allows the epiphysis to displace on the femoral neck. If a prepubertal child (more commonly boys) complains of hip or knee pain with reduced range of hip movement on assessment and a leg which rests in an externally rotated and shortened position, X-rays should be requested (including lateral views) to rule out SUFE. Most slips are pinned in situ and the role of the physiotherapist is to regain range of movement, strength and re-educate gait postoperatively.

Abnormalities of the knee

Knee pain

Pain or aching around the knee is a relatively common complaint amongst children, particularly those who engage in sport or during rapid periods of growth when traction injuries may occur. As mentioned, referral of pain from the hip, particularly SUFE, should be excluded. Swelling and pain in the knee can also be caused by juvenile rheumatoid arthritis,

infections in the knee joint (septic arthritis), and certain types of bone cancer, including osteogenic sarcoma.

Osteochondritis dissecans

The child will complain of localised tenderness and locking of the joint if a loose body occurs. The prognosis is better in children than adults. Management is initially rest, ice and isometric exercises followed by a progressive exercise programme to regain range of movement and muscle strength and to encourage a gradual return to full activities.

Osgood–Schlatter's disease (traction apophysitis of the patella tendon insertion)

The child will complain of pain, swelling and localised tenderness over the tibial tubercle. Initial management is again rest and analgesia. This is a self-limiting condition but ice, taping to reduce the pull of the quadriceps and hamstring stretches can be helpful in managing the symptoms.

Patellofemoral pain (often due to patello maltracking)

As in adults, taping and quadriceps strengthening (particularly VMO) can be very effective.

Abnormalities of the foot and ankle

CTEV

This is commonly known as club foot, and is a deformity of unknown aetiology, in which the foot is in an equinovarus position. Physiotherapy input will depend on whether this deformity is postural or structural.

Postural/positional

Bony anatomy of foot is normal, but foot has been held in an abnormal position in utero.

The foot will usually correct spontaneously but the carer can be shown appropriate passive stretches.

Structural/rigid

- Bony anatomy of foot is abnormal.
- Triplanar deformity with hindfoot equinus and varus, midfoot cavus and forefoot adduction and supination.

- This may be idiopathic, neuromuscular (e.g. spina bifida) or syndromic (e.g. arthrogryposis).
- There are various scoring systems, but the Pirani scoring system is reliable, quick, and easy to use, and provides a good forecast about the likely treatment for an individual foot. It records deformity on a scale of 0 (full correction) to 6 (severe deformity) (Dyer & Davis 2006).

Management consists of serial casting to correct the various components of the deformity. This is commonly carried out by a physiotherapist and commenced as early as reasonable after birth. The most universally recognised method of doing this is the Ponseti method (specific manipulation and casting technique, followed by early Achilles tendon tenotomy and the use of boots and bar to maintain the corrected position up to the age of 4 years). Compliance with treatment may be more difficult as the child gets older but failure to do so is associated with a higher relapse rate. This method is successful in 95% of feet, avoiding formal surgical release, although percutaneous tenotomy is usually required. Tibialis anterior transfer can be used to correct dynamic supination in toddlers.

Congenital vertical talus (CVT)

CVT presents as a 'rocker bottom' foot as the navicular dislocates dorsally on the talus and the head of talus can be felt in the sole of the foot. These feet can also be managed with casting and early results of reverse Ponseti plastering, followed by wire fixation, are promising (Dobbs et al 2007).

Tarsal coalition

Presents as a stiff, painful flat foot and the child may have difficulties walking and running. Physiotherapy will not improve these children but the bar can be resected. In these instances, physiotherapy may be needed to regain range of movement and re-educate gait postoperatively.

Severs disease

Presents as heel pain related to activity. Calf muscle stretches are the mainstay of treatment.

Upper limb abnormalities

Function must be the most important consideration when managing abnormalities of the upper limb. Children cope very well with disability and adapt quickly.

Radial club hand

Commonly associated with other congenital anomalies (e.g. VACTERL syndrome). Physiotherapy management is serial plastering as club foot and splinting.

Radioulnar synostosis

Usually presents some time after birth with fixed forearm rotation. Physiotherapy will not increase the range of movement but input is usually required to assess which position is most functional for the child as osteotomy can change the fixed position but not restore range of movement.

Limb length discrepancy

Limb length discrepancies may be caused by congenital deficiencies or occur secondary to infection, vascular injury, trauma, neurological problems, resection of tumours or conditions such as Ollier's disease.

Management will depend on the amount of shortening predicted at skeletal maturity, the stability of adjacent joints and the wishes of the parents and child.

- A limb length discrepancy of under 2 cm does not require intervention unless the child is complaining of symptoms. In this case, a 1 cm raise can be accommodated within the shoe.
- For a discrepancy of up to 5 cm the family has two choices:
  - A shoe raise: in general, the raise should not be the same as the measured discrepancy, as this will result in problems with foot clearance, nor anything over 5 cm as this becomes too heavy to be functional.
  - Epiphysiodesis or plates to ablate/slow the growth of the longer leg so that the legs are equal by the time the child reaches skeletal maturity.
- For a discrepancy over 5 cm the options are:
  - Limb lengthening with an external fixator
  - Combination of limb lengthening and epiphysiodesis
  - Extension prosthesis
  - Amputation and prosthesis.

Physiotherapy plays an important role in the management of children undergoing any of these procedures. Whilst the intensity and methods may vary, the aims for each are:

- Preoperative planning:
  - To ensure realistic expectations of the child and family
  - Liaison with school and relevant local services
  - Provision of wheelchair and any equipment required.
- Postoperative management:
  - Maintain joint range of movement
    a. Use of splints for joints above and below

b. Active and passive exercises
– Encourage functional activity
– Weight bearing as indicated in postoperative notes
a. This is usually full weight bearing as axial loading is important for osteogenesis
b. Children with congenital causes of limb length discrepancy frequently have upper limb abnormalities and so crutches/walking frames may need adapting
– Transfer practice including bed to chair, on/off floor, stairs
– Independence in activities of daily living.

Spinal abnormalities

Obstetrical brachial plexus palsy (OBPP)

A birth injury due to a tearing force on the cervical nerve roots caused by extreme traction of the head from the shoulder girdle during delivery, resulting in a flail upper limb. The most common type is Erb's palsy (paralysis of nerve fibres from C5–C6). Risk factors include overweight babies (particularly those requiring forceps or ventouse extraction), small babies with breech presentation, prolonged second stage of labour or a previous child with OBPP.

All limbs should be examined to exclude quadriplegia, although bilateral OBPP has been reported. A full assessment with muscle testing can then be undertaken 48 hours after delivery to differentiate the patterns of paresis and determine the nerve roots damaged. Most children achieve full recovery (Eng et al 1996).

Physiotherapy management will consist of:

- Regular assessment of range of movement and muscle power.
- Passive stretches to prevent muscle and joint contractures (hand, wrist, forearm and elbow from birth and shoulder around the age of 5 days). Stretches are very specific and so, whilst the family can be taught them, it is advisable that regular contact is maintained by the physiotherapist (APCP 2001).
- Tactile stimulation.
- Weight-bearing exercises through the affected limb when indicated.
- Referral on to a specialist centre for consideration of surgery if return is not noted by the time the child is 3 months old.
- Advice to encourage awareness and use of the affected limb after 6 months of age.

Congenital muscular torticollis

Torticollis is a descriptive term of abnormal posture in which the head and neck are held in side flexion towards the affected side with rotation of the head to the opposite side. There have been more than 80 causes postulated for torticollis. An alogorithm for differential diagnoses was developed by Ballock and Song (Ballock and Song 1996).

Physiotherapy management entails:

- Positioning to improve head position and muscle length and skull shape
- Encouraging active movement to address the muscle imbalance
- Strengthening overstretched muscles through use of postural reactions as the baby gains head control (e.g. head-righting reflex)
- Educating parents on handling, playing and positioning of child's equipment to encourage the desired movements.

Torticollis usually resolves without long-term effects but surgical release may be necessary if restriction of movement persists at the age of 1 year. Following surgical release of the sternomastoid muscle, passive movements may be started by the physiotherapist from 24 hours postoperatively. These should be carried out with the child supine, the shoulder girdle stabilised and gentle traction applied. The parents can be taught these preoperatively and take over from the physiotherapist when able. A child may also be given a collar for support and comfort in the first few weeks postoperatively. Active exercises are also important to redress the muscle imbalance and the child will need verbal and visual prompts to correct their head position. There may be some short-term visual disturbance until the eyes have accommodated to the improved head position.

Positional plagiocephaly

This occurs when a baby spends prolonged periods resting in one position. The child may present with an apparent torticollis and an asymmetrical posture but this will be due to difficulties moving off the flattened skull rather than restriction in passive movement. As movement becomes more difficult it increases the flattening and perpetuates the cycle. Physiotherapy is therefore aimed at restoring active movement by encouraging the baby to turn its head using toys and mobiles and ensuring frequent position changes, including supervised 'tummy time' in the first few months of life. It is also important to encourage the baby's general motor development (Hutchison et al 2004).

There is increasing interest amongst parents in the use of helmets to reshape their baby's heads. Their use remains controversial as the majority of heads recover their shape as babies become more active. However, they may have a place in the more severe or resistant cases.

Scoliosis

- Deformity is multiplanar and includes a rotational component.
- Aetiology may be congenital (underlying bony malformation), neuromuscular, syndromic or idiopathic.
- Back pain associated with scoliosis may be associated with an acquired cause such as infection or tumour.
- Treatment depends on the severity and curve progression – it varies from observation, through bracing, to surgery.
- Physiotherapy management for the idiopathic scoliosis may include exercises (controversial) and postural advice.

- Physiotherapy for the neuromuscular scoliosis will include positioning equipment for lying, sitting and standing.

Motor disorders

This section explores the medical and surgical management of the altered tone found in motor disorders covering focal and more generalised management including reversible and nonreversible changes that can be brought about through treatment (Figure 1.4).

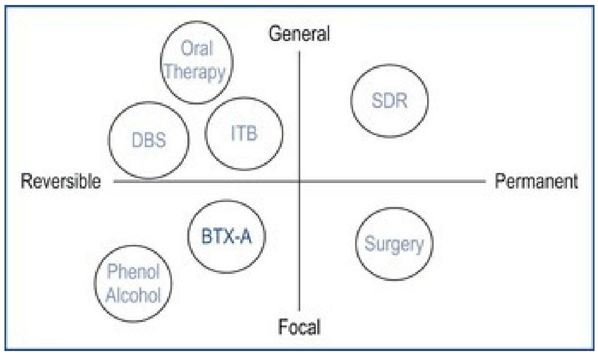

Figure 1.4 Management of increased tone.

Physiotherapy intervention is covered in Chapter 5 in this volume.

Oral medication

Spasticity management

Baclofen

Baclofen works by binding to GABA B receptor sites to inhibit the release of excitatory neurotransmitters at the spinal cord level. It is the drug most commonly used in paediatrics for spasticity management. Side effects can hinder increase in dose to an effective level, e.g. drowsiness, difficulty concentrating at school, increased dribbling, decreased truncal tone and therefore reduced stability.

Benzodiazepines

Diazepam is the most commonly used and works by creating an inhibitory response at the reflex arc. It is particularly helpful in reducing painful spasms that may produce insomnia.

Dantrolene

Dantrolene works at the muscle level and inhibits the release of calcium ions from the sarcoplasmic reticulum, which reduces the force of the muscle contraction. Its greatest effect is on fast twitch muscles. Dantrolene is metabolised by the liver creating a risk of hepatotoxicity. Regular monitoring of liver enzymes is recommended when using this drug.

Alpha-2 adrenergic agonists

Tizanidine is the most commonly used alpha-2 adrenergic agonist, which acts at the level of the brain and spinal cord. It also carries the risk of hepatotoxicity and so regular monitoring of liver enzymes is recommended (Gage et al 2009).

Dystonia management

Trihexyphenidyl is an anticholinergic on the CNS, i.e. it blocks the effect of acetylcholine, therefore re-establishing a balance between excitatory acetylcholine, and inhibitory dopamine. Many side effects are associated with this drug, which again influences the ability to increase the dose. Side effects include urinary retention, constipation, blurred vision, and dry mouth (which may be beneficial if there's a lot of drooling) – they may need to reduce use of hyocine patches if being used.

Intrathecal baclofen (ITB)

Baclofen is delivered to the intrathecal space in the spine via an implanted drug pump surgically inserted into the abdomen. The pump is programmable so dose and timing can be preset. Before an ITB pump is inserted, the child is assessed by the multidisciplinary team and clear functional goals are set.

ITB is usually considered for children of GMFCS levels IV–V with generalised spasticity, dystonia or mixed picture, for pain relief, caregiver satisfaction and ease of care. However, in some centres ITB has been successfully used in ambulant patients (GMFCS LEVEL III).

A test dose tends to be given in most centres to determine whether the child will respond positively.

Although more invasive, the advantage of ITB in comparison to oral baclofen is that lower doses of baclofen can be administered directly via the catheter resulting in reduced side effects for the child.

Deep brain stimulation

Deep brain stimulation (BP-DBS) is a surgical procedure in which electrodes are implanted to stimulate parts of the brain to reduce involuntary movements and tremors.

It has been shown to be an effective treatment for primary generalised dystonia. However, the effect of this treatment on secondary dyskinesias such as dystonia–choreoathetosis as seen in cerebral palsy is not as clear. The deep brain stimulators consist of electrodes placed in the basal ganglia. The leads are connected by wire to the main implant

near the collar bone or abdomen. A generator inside the implant sends electrical pulses through the leads into the brain.

Outcome is usually measured using a dystonia scale and quality of life measure.

Selective dorsal rhizotomy

SDR tends to be performed at L1–S2. The roots are divided into sensory and motor divisions. The sensory roots are stimulated with electrodes and those roots associated with an abnormal response are divided to reduce the sensitivity of the muscle spindle.

Centres often have strict criteria to ensure correct patient selection.

These include:

- Neuroimaging consistent with periventricular leukomalacia
- Spastic tone rather than dystonic
- Evidence of fair selective muscle control and muscle strength
- Ability to co-operate and follow through with long-term therapy programme post-operatively
- Walking is prime method of mobility.

Focal management of spasticity/dystonia

Botulinum toxin

Botulinum Toxin A is indicated for the treatment of focal spasticity (Delgado et al 2010). There are two preparations available commercially for use in paediatrics (Dysport and Botox).

Botulinum Toxin A is injected into the muscle usually under sedation or whilst using Entonox in the paediatric population. The effects can be seen 12–72 hours postinjection, but are usually maximal around 2–3 weeks postinjection.

The toxin is injected as close as possible to the motor end plate, and internalised into the nerve ending, which inhibits the release of acetylcholine, causing temporary denervation, resulting in reduction of muscle tone in the injected muscle.

Injection of the toxin is recommended to be carried out with the guidance of US or EMG. The child is usually sedated and in some cases injections take place in theatres under a general anaesthetic.

The dose available to use is limited based on patient weight, so it is important to prioritise the muscles that are interfering the most with function. Setting functional goals with the family and members of the local team is essential to ensure optimal choice of muscles.

Phenol injections

Phenol can be injected directly onto the nerve with electrical stimulation to aid guidance. The phenol causes a neurolysis, which causes denervation with a reduction in afferent and efferent impulses. The phenol neurolysis can take 10–60 minutes to occur and can be painful, and is therefore carried out under general anaesthetic (GA). Phenol blocks generally last 3–12 months and are done on superficial nerves, e.g. obturator nerve.

Alcohol injections

Alcohol can be injected into the muscle to cause denervation. They can be painful and are done under GA, and are usually done for larger muscles.

Orthopaedic surgery

This can be either single or multilevel depending on the needs of the child. Surgery can involve soft tissue lengthening, muscle transfer or bony surgery to correct lever arm dysfunction.

Cardiorespiratory management

Background

- The main goal of physiotherapy is to maximise cardiorespiratory function in children by treating or preventing cardiorespiratory problems.
- This is usually achieved by assisting with the removal of tracheobronchial secretions, removing airway obstruction, re-expanding areas of collapsed lung, reducing airway resistance, optimising gas exchange and reducing the effort of breathing in children with respiratory distress (Wallis and Prasad 1999).

Non-intubated children

- Treating sick children can be very challenging at times.
- It may be necessary to use persuasion and distraction with things like games, songs, storybooks and rewards to build rapport and engage the child.
- It may also be appropriate to involve and direct play specialists to help with physiotherapy treatment, if they work on the ward.
- A non-intubated child could be referred to cardiorespiratory physiotherapy for a number of reasons, including:
  - Post-surgery: this may range from seemingly simple procedures in patients with or without underlying chronic respiratory disease to major surgery that might also involve the respiratory muscles themselves.

- – Acute lung infections in otherwise healthy children or those with underlying chronic respiratory or neurological disease.
  – Parapneumonic effusions that require drainage and re-expansion of the resulting collapsed lung.
- Generally, the main problems identified during assessment relate to retention of sputum, loss of lung volume and increased effort of breathing with visible signs of respiratory distress.
- Physiotherapy treatment techniques used to address these problems are similar to those used in adults, but will need to be modified to be effective in children.
- It is important to remember that the diaphragm is the main muscle of respiration in babies and small children and that it has less fatigue-resistant muscle fibres (Type 1) compared with adults (Keens and Lanuzzo 1979).
- In the sicker non-intubated child with respiratory distress, care should be taken to preserve the function of the diaphragm in order to avoid further deterioration and possible intubation.

Breathing exercises

- Deep breaths help to re-expand collapsed areas of lung and assist with secretion clearance by getting air behind sputum.
- As with adults, mobilisation should be used where possible, especially in the low-risk patient (Bourn and Jenkins 1988).
- In older children, this could be achieved by sitting over the edge of the bed, sitting out of bed or going for a walk.
- If mobility is restricted (usually for surgical reasons) things like incentive spirometers could be considered.
- In younger children, active play, depending on age, ability and postoperative restrictions, should be encouraged.
- Alternatively, blowing games with the child sitting upright could be used, e.g.
  – Blowing bubbles
  – Blowing into cups of liquid (not soapy!) with straws to make bubbles
  – Blowing paint around paper with a straw
  – Singing songs and getting them to join in
  – Reading stories and getting them to join in, particularly stories with huffing and puffing like the well-known story about the 3 little pigs.

Huffing and coughing

- Forced expiration techniques or huffing assists with sputum clearance by moving sputum from the peripheral to the more central airways where it can be cleared with a cough.
- Huffing from mid to low lung volume can be taught to children as young as 3 years of age and is a very effective airway clearance technique (Pryor and Webber 1979, van der

Schans, C. P. 1997).

- Some children may have difficulty maintaining an open glottis, if this is the case, a tube like a cardboard peak flow tube may be used.
- It is important to note that young children are unable to cough to command effectively.
- Children are often unable to expectorate and usually swallow their secretions.
- Getting children to laugh is a good way to encourage coughing and can often be achieved by playing games or tickling the child.
- In babies, changing position, like putting them over your shoulder and patting their back or bouncing them up and down on your lap might encourage them to cough.
- If they are able to sit unsupported then playing games and getting them to move about might work.

Manual techniques

- In sicker, less mobile children positioning with percussion, which is rhythmic clapping to the affected areas of lung, is a widely used and well-tolerated technique (Tudehope and Bagley 1980).
- It is often used clinically in non-intubated children.
- The aim of percussion is to loosen bronchial secretions, encouraging the child to cough spontaneously.
- Contraindications to the use of percussion are the same as in adults.
- There are various ways of performing this technique depending on the age of the child.
- In small babies, the smaller Palm Cups® percussors or three fingers with the middle finger raised to overlap the first and third fingers (tenting) can be used.
- In bigger children, the bigger Palm Cups® percussors or a single cupped hand can be used.
- It is advisable to use a thin layer of clothing, towel or blanket to protect the child's skin.

Suction

- In non-intubated children, suction should only be used when secretions cannot be cleared by any other means and when they are clearly detrimental to the child's condition, e.g. obvious signs of respiratory distress, decreased saturations and increasing oxygen requirement.
- Nasopharyngeal suction in side lying with the child restrained is usually the treatment of choice to minimise the risk of vomiting and aspiration.
- If suction is used then it should be performed quickly with the smallest catheter required to be effective and the lowest suction pressure possible.
- Both the child and the parents will need to be given lots of reassurance.
- It is advisable to have supplemental oxygen and resuscitation equipment on hand.
- Remember that it takes time to build up trust with the family and the child, therefore, where possible, continuity of care is important for all involved.

The paediatric intensive care unit (PICU)

- On average, there are nearly 16 500 admissions to PICU in the UK each year.
- Of these, nearly half are children less than 1 year of age.
- About 60% require mechanical ventilation.
- Most children stay in PICU for 2 days or less.
- The main reasons for admission are cardiovascular, respiratory or neurological problems (PICANet 2010).
- The PICU environment can be hugely overwhelming and stressful for those who have not experienced it before.
- There are lots of factors contributing to this (Box 1.1).
- It is important to appreciate that acutely ill children can change very quickly.
- Not only do they have the potential to deteriorate very rapidly, but they also have a tendency to improve rapidly.
- This makes PICU a very challenging and rewarding environment in which to work where excellent clinical reasoning and problem-solving skills are essential.

Box 1.1 Some of the stressful factors associated with PICU

- Stressful environment, lots of flashing lights and noise
- Presence of parents
- Often immediate intervention is required
- PICU is an emotional area
- There are many people involved in the MDT
- It can seem scary
- There is a lot of equipment for a very small child
- The problems are complex
- Decisions have to be made about whether to treat or not

Intubation and ventilation

- Although they can be intubated orally, children often have nasal endotracheal tubes, which are uncuffed.
- Unlike adults, the narrowest part of the upper airway in babies and children is the circular cricoid ring, so a good seal is possible without a cuff.
- Although uncuffed tubes are thought to be less damaging to the tracheal mucosa, if they don't fit well, there is the potential for substantial endotracheal tube leak.
- This can affect accuracy of ventilation delivery, monitoring of the patient (Main et al 2001) and can also complicate physiotherapy, particularly when trying to interpret sounds during auscultation.
- Intubated and ventilated children and infants are particularly vulnerable to respiratory complications.

- They are also frequently pharmacologically sedated and paralysed, which means that they have no cough reflex.
- Secretion clearance can be a problem in these children and regular physiotherapy assessment and treatment is very important.
- Depending on assessment findings, physiotherapy treatments may consist of positioning, manual hyperinflations, saline instillation, chest wall vibrations and suction.
- Contraindications and precautions for the use of these treatment components in children are generally the same as in adults.

Positioning

- There are many reasons for using positioning as part of physiotherapy treatment.
- In terms of respiratory function, the supine position has been shown to have the least advantages (Dean and Ross 1992).
- Prone positioning is thought to have the most advantages (Pryor and Prasad 2008).
- Due to the association of prone positioning with sudden infant death syndrome, it should only be used when the child is being monitored (Southall and Samuels 1992).

Ventilation and perfusion

- In adults, both ventilation and perfusion are preferentially distributed to the dependent lung.
- In order to achieve optimal oxygenation the diseased lung is placed uppermost.
- Children and infants are different in that they ventilate best in the uppermost, non-dependent regions of the lungs (Davies et al 1985), but perfuse the dependent areas of the lungs best, creating a mismatch in ventilation and perfusion (Bhuyan et al 1989).
- To achieve optimal oxygenation, the good lung should be placed uppermost (Heaf et al 1983).
- However, if the physiotherapy goal is to improve ventilation and facilitate secretion clearance of the diseased lung using positioning and postural drainage, the child should spend a proportion of time with the diseased lung uppermost.
- It is important to note that this position may not be tolerated well and oxygen and ventilation settings may need to be adjusted to achieve this goal.
- There is also the risk of rapid deterioration of the child's respiratory status.
- As with all practice, the physiotherapist would have to clinically reason their decision based on the stability, tolerance and therapeutic goals for the individual patient in conjunction with the multidisciplinary team.

Manual hyperinflation (bagging)

- This technique is performed using an open-ended 500 mL bag in infants and smaller children or 1 L bags in older children.

- It usually involves giving a long inspiration with an inspiratory pause followed by rapid release of the bag.
- This is thought to recruit collapsed lung units and increase expiratory flow moving secretions from the peripheral to the more central airways (Maxwell and Ellis 2003).
- Inflation pressures should be monitored using a manometer in the circuit and should not exceed 10 cmH_2O above the peak ventilator pressure.

Chest wall vibrations

- Chest wall vibrations are rapid compressions applied to the chest wall at the start of expiration with a continued oscillatory pressure until expiration is complete.
- In intubated infants and children they are usually performed in conjunction with manual hyperinflation.
- Current research in this area has shown that chest wall vibrations have the potential to augment expiratory flow in order to move secretions from the peripheral to the more central airways where they can be cleared by suction (Gregson et al 2007).
- It has been shown that each physiotherapist has their own unique way of performing chest wall vibrations which is highly repeatable within treatments.
- However, there is huge variation between therapists in magnitude and duration of the chest wall vibrations as well as in the amplitude, number and frequency of oscillations within them (Shannon et al 2009).
- In order to be maximally effective and safe, timing between the chest wall vibrations and the manually delivered breaths should be optimal (Shannon et al 2010).

Saline instillation

- Instilling saline into the endotracheal tube of ventilated patients aims to loosen thick or sticky secretions and assist with their removal using suction (Schreuder and Jones 2004).
- Evidence supporting or refuting this practice is variable and conflicting.
- However, many experienced physiotherapists believe saline instillation to be well tolerated and regularly use saline in their treatment of infants and children.
- The reasons for doing this are to assist with secretion clearance and to avoid narrow endotracheal tubes and suction catheters blocking off.

PICU summary

- As with all physiotherapy practice, it is important to remember that constant reassessment and evaluation is necessary throughout physiotherapy treatment of children and infants in intensive care.
- For more detailed information regarding paediatric assessment and treatment, please refer to Pryor and Prasad (2008, chapter 10).

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Chapter 1

E-materials

Author profiles

Deborah Jackson MSc BSc(Hons) MCSP

Deborah Jackson is a specialist paediatric physiotherapist working in neuro-orthopaedics at Great Ormond Street Hospital in London. She qualified in 1993 and has worked within the field of paediatrics for 12 years, predominantly in the in-patient setting. She has lectured nationally and internationally, chiefly in the area of Cerebral Palsy and orthotic provision.

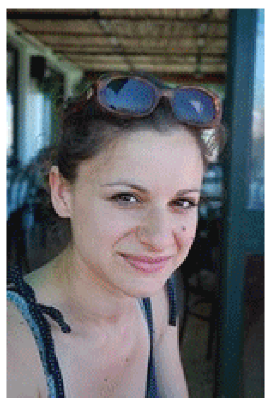
Lesley Katchburian MSc MCSP

Lesley Katchburian is a Clinical specialist physiotherapist working in Neurodisability at Great Ormond Street Hospital for Children in London. Lesley qualified in 1987 with a BSc (Hons) in Physiotherapy and gained a Masters Degree in Physiotherapy in 1997, with a thesis exploring the effect of Botulinum toxin A on function in children with Cerebral Palsy. Her specialist area is the management of tone in Paediatric Motor disorders and she works as part of an established multidisciplinary team in a tertiary setting.

An experienced clinician Lesley has contributed to guidelines about the use of Botulinum Toxin A in paediatrics, Guidance for Physiotherapy injectors and Transition for the young person with motor disorders. She is currently Research Officer for the Association of Paediatric Chartered Physiotherapist and is an executive member of The British Association of Childhood Disability.

Josephine Scerri BSc(Hons) MCSP

Josie Scerri is a senior Physiotherapist working as part of the Movement Disorder Service Team at Great Ormond Street Hospital. Josie has been working as a Paediatric Physiotherapist for 11 years.



Robyn Stiger MSc BSc(Hons) MCSP

Robyn qualified with a BSc(Hons) Physiotherapy from Keele University and gained an MSc in Advanced Cardiorespiratory Physiotherapy from University College London.

Clinical roles have included working as an Advanced Physiotherapist at the University Hospital of North Staffordshire, band 7 roles in cardiorespiratory, including paediatrics and paediatric ICU. Robyn is currently an associate lecturer at Oxford Brookes University.

Tim Ainslie MSc MCSP MMACP

Qualified 1984, The Middlesex Hospital School of Physiotherapy. A clinical and managerial career spanning 16 years included working at London's Hammersmith, Charing Cross and Whittington hospitals. Extensive experience was also gained in primary care settings in the NHS, the independent sector and with a charity initiating a physiotherapy service in Palestine. In 2000 joined Oxford Brookes University as a Senior Lecturer and Clinical Education Coordinator and is currently Joint Chair of the National Practice Education Forum at the Chartered Society of Physiotherapy.

Appendix 1.1

Appendix 1.1 WHO framework for measuring health and disability

Assessment measures available are listed in the categories specified in the WHO International Classification of Function.

This is by no means a comprehensive list, but indicates some of the more commonly used assessments currently in use in tertiary centres around the UK.

Body structure/function:

- Goniometry
- Modified Ashworth Scale
- Modified Tardieu
- Gait analysis – Edinburgh Visual Gait Score, Observational Gait Scale, Physician Rating Scale
- BFM/Barry Albright
- Pain scales: Wong–Baker, VAS
- Goal Attainment Scale (GAS)
- SCALE/SMC

Activity/participation:

- Functional Mobility Scale (FMS), Gillette
- Paediatric Outcomes Data Collection Instrument (PODCI)
- Gillette Functional Assessment Questionnaire (FAQ)
- GMFM
- Gait analysis
- PEDI
- COPM
- CPCHILD
- WeeFIM
- GAS

Appendix 1.2

Holland Bloorview Kids Rehabilitation Hospital

Bloorview Research Institute

HYPERTONIA ASSESSMENT TOOL (HAT) - SCORING CHART

Name: ____________	**Chart/File #:** ____________
Clinical Diagnosis: ____________	**Date of Birth:** ____________
Limb Assessed:	**Gender:** ☐ Male ☐ Female
☐ Arm ☐ Left ☐ Right	**HAT Assessor:** ____________
☐ Leg ☐ Left ☐ Right	**Date of Assessment:** ____________

HYPERTONIA ASSESSMENT TOOL (HAT)

HAT ITEM	SCORING GUIDELINES (0=negative or 1=positive)	SCORE 0=negative 1=positive *(circle score)*	TYPE OF HYPERTONIA
1. Increased involuntary movements/postures of the designated limb with tactile stimulus of another body part	0= No involuntary movements or postures observed	0	DYSTONIA
	1= Involuntary movements or postures observed	1	
2. Increased involuntary movements/postures with purposeful movements of another body part	0= No involuntary movements or postures observed	0	DYSTONIA
	1= Involuntary movements or postures observed	1	
3. Velocity dependent resistance to stretch	0= No increased resistance noticed during fast stretch compared to slow stretch	0	SPASTICITY
	1= Increased resistance noticed during fast stretch compared to slow stretch	1	
4. Presence of a spastic catch	0= No spastic catch noted	0	SPASTICITY
	1= Spastic catch noted	1	
5. Equal resistance to passive stretch during bi-directional movement of a joint	0= Equal resistance not noted with bi-directional movement	0	RIGIDITY
	1= Equal resistance noted with bi-directional movement	1	
6. Increased tone with movement of another body part	0= No increased tone noted with purposeful movement	0	DYSTONIA
	1= Greater tone noted with purposeful movement	1	
7. Maintenance of limb position after passive movement	0= Limb returns (partially or fully) to original position	0	RIGIDITY
	1= Limb remains in final position of stretch	1	

SUMMARY SCORE – HAT DIAGNOSIS

		Check box:
DYSTONIA →	Positive score (1) on at least one of the Items #1, 2, or 6	☐ Yes ☐ No
SPASTICITY →	Positive score (1) on either one or both of the Items #3 or 4	☐ Yes ☐ No
RIGIDITY →	Positive score (1) on either one or both of the Items #5 or 7	☐ Yes ☐ No
MIXED TONE →	Presence of 1 or more subgroups (e.g. dystonia, spasticity, rigidity)	☐ Yes ☐ No

HAT DIAGNOSIS: ____________
(Fill in all that apply)

HAT Manual can be accessed at http://www.hollandbloorview.ca/research/scientistprofiles/fehlings.php

Case Study 1.1

Respiratory

Background

- Baby A was a neonate who was 1 day old.
- She was born at 41/40 weeks gestation in the hospital car park before being admitted to NICU.
- It was thought that she had most likely aspirated meconium during birth and was being treated with antibiotics.
- The medical plan for Baby A, should she continue on this worsening trend, was to commence nitric oxide, use HFOV (high-frequency oscillatory ventilation) and refer her for ECMO.
- Baby A was referred via an emergency bleep for urgent physiotherapy assessment and treatment as she was deteriorating rapidly from a cardiorespiratory point of view.

Assessment

- Her mother was not present on our arrival to gain consent.
- On assessment Baby A was supine as she had just had an urgent chest X-ray.
- She was nasally intubated and ventilated using pressure control ventilation. A high peak pressure was required due to her age (PIP = 25 PEEP = 5). Respiratory set rate of 60.
- She was pharmacologically sedated and paralysed.
- Baby A required inotropes to maintain her blood pressure – her beside chart showed that these were on an increasing trend.
- Her fluid balance was acceptable, as was her urine output.
- Her oxygen requirement had dramatically increased throughout the course of the morning and was currently 80%.
- She was struggling to maintain acceptable saturations, her pO_2 was low and her pCO_2 was climbing.
- She also had a worsening respiratory acidosis.
- The nurse looking after Baby A said that she was finding it difficult to obtain much on suction, even with saline.
- The nurse of the previous shift had reported some small sticky dark plugs of sputum especially on turning.
- Baby A was not tolerating intervention particularly well with some episodes of desaturation and associated bradycardia.
- An urgent chest X-ray revealed opacification in both the right and left upper lobes. Air bronchograms were present in both the right and left main bronchi.
- Palpation assessment showed that she had reasonable chest expansion, with no palpable secretions.
- On auscultation, she had very quiet breath sounds throughout both sides with bronchial breath sounds in her upper chest areas. There were no added sounds.
- In conjunction with the MDT caring for this baby, the physiotherapist thought that Baby A's main problems were:
  - Secretion retention. Baby A was pharmacologically paralysed so did not have a cough reflex to move secretions for clearance on suction
  - Loss of lung volume as a result of the collapse/consolidation in her upper lobes caused by a combination of mucous plugging and resolving infection
  - High oxygen requirement with associated high ventilation pressures, both of which are damaging to delicate newborn lung tissue.

Treatment

- As the upper lobes were affected, Baby A was treated in supine. Both sides were treated in turn, with the baby's head turned to the left to treat the right side and turned to the right to treat the left side.
- Cycles of physiotherapy treatment consisting of:
  - saline instillation (varying from a few drops to 1 ml).
  - manual hyperinflation using a 500 ml open-ended paediatric bag (as Baby A was a

full-term neonate) with pressures of up to 30 cmH_2O and 5 cm PEEP

– chest wall vibrations which mimic a cough in the absence of a cough reflex and move secretions via increased expiratory flow from the peripheral to the more central airways where they can be removed by suction.

- Endotracheal suction using a size 7 catheter was performed.
- Copious, thick sticky brown plugs of sputum were obtained.
- 8 suctions were needed in total. Baby A was stable throughout treatment. A reasonable amount of saline was used to avoid plugging off as the sputum was so thick.
- The physiotherapy plan post treatment was to position the baby in prone for 4–6 hours, turning the head from side to side as per normal protocol for a decent rest, and only to suction if required.
- Another physiotherapy session was required after 6 hours and was similar to above again treating Baby A in supine, but only three suctions were required.
- Physiotherapy treatment overall was very effective.
- Breath sounds were much clearer and there was better chest expansion.
- Oxygen was quickly weaned down first to 60% after the first treatment and then to 40% after the second.
- Inotropes were weaned as respiratory function improved.
- Ventilation pressures were also weaned down after the second treatment.
- Paralysing drugs were switched off on the second day, so Baby A was able to cough on suction and was able to be managed by the nursing staff.
- Baby A was extubated onto CPAP 2 days later and was discharged home 13 days later.

Case Study 1.2

Four-year-old boy with cerebral palsy

Background

- 4-year-old boy with diagnosis of cerebral palsy attends clinic. He was referred by local team for advice on management and due to parental concerns.
- Parents would like to know prognosis and their main difficulties are:
  - Personal care due to difficulty abducting legs
  - Positioning due to extensor spasms.
- He lives with his parents and is dependent on them for all mobility and has a variety of comorbidities such as reflux, seizures and poor cough and swallow.
- He is fed via PEG.
- He is able to communicate happiness or distress, but has no receptive or expressive communication.
- Drug history

  - Seizure management medication
  - Baclofen to manage tone.
- He attends nursery set up for children with special needs.
- He has input from local services and there has been no regression in his abilities.
- He has had blocks of treatment at the Bobath Centre in the past.
- He has appropriate equipment at home and at nursery for positioning, transfers and personal care.
- He has AFOs for use in standing frame.
- He has not trialled lycra.

Assessment

No previous MRI has been carried out and no investigations to ensure diagnosis of CP is correct.

Objective

- On examination, child presents with mixed pattern of spasticity and dystonia with extensor spasms through legs and trunk, and underlying low tone in trunk.
- He has limited mobility and would be classified as GMFCS V once diagnosis of CP is confirmed.
- There is asymmetry of leg abduction with apparent discomfort with hip movements.
- Wheelchair noted to allow client to posterior tilt and push into extension.
- Parents have good handling techniques.

Plan

- Hip X-ray (children from 30 months with CP or movement disorder should have hip X-ray if not yet walking).
- MRI to ensure presentation of child is consistent with MRI findings.
- Started on trihexyphenidyl to manage spasms (medication for dystonic spasms can be started irrelevant of diagnosis).
- Placed on waiting list for Botulinum toxin injections to hip adductor muscles.
- Review in 3–4 months to assess affect of trihexyphenidyl.

After appointment

- Info from conversation included in report and circulated to all members of local MDT.
- Liaison with local therapy team via telephone about outcome of appointment.
- Discuss whether lycra has been considered in the past and potential for it to be used now.
- Ask for contact details of wheelchair service to provide them with a copy of the report.

Telephone contact with family 2 weeks later

- Results of hip X-ray and MRI fed-back to parents:
- On reviewing hip X-ray, bilateral subluxation *was* noted and *he was* placed on the waiting list for joint Neurology and Orthopaedic clinic.
- Results of MRI are consistent with HIE with basal ganglia affected and therefore consistent with diagnosis of CP (if the MRI result was not consistent with CP, the child would be reviewed sooner and results fed-back to parents in person).
- Contact details of team given to parents should they have any queries.
- Info from conversation included in report and circulated to all members of MDT.
- Liaison with local therapy team via telephone.

Review after 4 months

- Trihexyphenidyl has reduced extensor spasms with resultant improvement in personal care; and positioning easier to manage.
- Taken off waiting list for Botulinum toxin injections.

Plan

- Review in 6 months to ensure dose still appropriate and no other complications arising, and to manage hips with Botulinum toxin as and when necessary.
- Parents able to call if concerns arise sooner for an earlier appointment.

Case Study 1.3

Background

- David a 5-year-old boy was admitted to PICU following an RTA head-on collision.
- David was in the front passenger seat, his mother carried him to a house nearby, at which point he complained that he couldn't feel his legs.
- He was placed on a spinal board and transferred to hospital by ambulance, he had a GCS of 14 at this time.

Assessment

- His injuries included:
  - Bruising where the seat belt had been
  - Lack of sensation and power below T4.
- Spinal CT showed:

– Spinal fractures of C5, C6 and C7
– Subluxation at C5/6 and C6/7 levels
– Cord transaction at C5/6 and oedema to C3.

Management

- He was transferred to PICU 2 days later for spinal surgery.
- Initial management included an aspen collar and sandbags with regular turns using log rolling.
- A further MRI confirmed initial findings and also revealed a PEG fracture.
- Cervical stabilisation was performed.
- Postoperative instructions included being nursed flat for 6 weeks for spinal cord optimisation with log rolling for pressure relief.
- Postoperatively he was given 2–5 L O_2 via nasal cannulae to maintain SaO_2.
- 2 days postoperative he developed a RUL collapse with worsening respiratory status requiring overnight facial CPAP – PEEP 5 cm.
- He also developed an occipital pressure sore and following recurrent UTIs he was catheterised.
- He had no abdominal muscles, therefore no effective cough and he was treated with positive pressure and an abdominal binder.
- Physiotherapy included:
  – Incentive spirometry
  – Blowing bubbles, etc.
  – Chest wall vibrations
  – Assisted cough (manual and with an abdominal binder).
- 19 days post collapse the bronchoscopy was performed to reinflate the lung. Post bronchoscopy, BiPAP was commenced with pressures of 16/6 with additional support from a Hayek Biphasic Cuirass Ventilation (BCV) (http://www.unitedhayek.com).
  – David used the Hayek 4 times a day with 2 cycles using the secretion clearance mode (CWV and inexsufflation).
  – This was stopped after 2 weeks and overnight BiPAP was stopped 2 weeks later.
  – At this point David was no longer on bed rest and was being stood using a tilt table.
  – He had no further respiratory problems during his time on the unit.
  – He was able to tolerate being able to sit out in a chair to watch TV or play on his play station and this was interspersed with daily sessions on the tilt table.
  – He was discharged to a spinal injuries unit 11 weeks post injury and at this point he could tolerate being upright to 50° for around 30 minutes.

Summary and conclusion

- David was admitted to PICU following his admission.

- He underwent surgery to stabilise his spine and during this time incurred some respiratory deterioration which was resolved with specific management.
- Following resolution of the respiratory problems David was able to begin sitting out of bed and to get used to being upright.
- He was given exercises for his upper limbs (games, karate and balloons).
- He was able to correct a tendency to lean to one side, indicating that he did have some control over his sitting balance.
- He was aware of his inability to feel below T4 and move his legs and appeared to accept this.
- He was given resting splints for his hands and feet.
- A specialist wheelchair had been ordered to coincide with his arrival at the spinal injuries unit.
- There was some preliminary communication with his school and local physiotherapy services so that they could prepare for his return after discharge from the spinal injuries unit.

Postscript

- This case demonstrates an anomaly between the level of cord transaction and the ensuing loss of power and sensation.
- David retained the ability to extend and flex the wrists and he was able to extend both elbows.
- There was some retained sensation down to T4 but nothing lower than this level.
- This discrepancy can occur in children and highlights the importance of completing an effective assessment and not to rely on imaging for the full presentation.

Chapter 1 Acute paediatrics multiple choice questions

1. If both parents are carriers of the cystic fibrosis gene, what is the likelihood of them having a child that has cystic fibrosis?
    a). a 1 : 6
    b). b 1 : 4
    c). c 1 : 7
    d). d 1 : 2
2. At 2 years a child can;
    a). Jump from a step using both feet together
    b). Sort and match objects
    c). Watch television and join in with songs
    d). Build a tower of 9 to 10 blocks

3. Children under 2 are likely to manage their pain better
   a). When anxious parents are encouraged to be with the child
   b). When a play therapist assists in the management of treatment
   c). When they are given the Eland colour scale to show where their pain is
   d). If they are allowed to play with toys
4. What is the correct term used to describe a 'non-progressive group of brain disorders resulting from a lesion or developmental abnormality in fetal life or early infancy'?
   a). Erb's palsy
   b). Cerebral palsy
   c). Duchene muscular dystrophy
   d). Motor neuron disease
5. The Ponseti Method is often used in the management of
   a). Congenital scoliosis
   b). Congenital talipes equinovarus
   c). Congenital pes planus
   d). Congenital hip dysplasia
6. Low muscle tone affects
   a). Joint stability
   b). Speed of movement
   c). Range of movement
   d). Cognition
7. Which of the following is required to perform efficient movement
   a). Fixation
   b). Strength
   c). Wide range of joint movement
   d). Flexibility
8. Botulinum Toxin Type A works by
   a). Blocking the signal between the nerve and muscle preventing muscle contraction
   b). Blocking the signal between the brain and the muscle preventing muscle contraction
   c). Blocking the signal between the antagonistic muscle to restore muscle balance
   d). Blocking the signal between the muscle and the brain
9. Which of these is a particular consideration for children's needs when planning treatment
   a). Social background
   b). Type of disability
   c). Level of understanding
   d). Ability to speak
10. A pattern of movement involves
   a). A muscle group
   b). One side of the body
   c). Several muscle groups

d). Grade IV+ (MRC) muscle power

11. The most common group of neuromuscular disorders are
    a). Congenital myopathies
    b). Peripheral neuropathies
    c). Congenital muscular dystrophies
    d). Progressive muscular dystrophies
12. Which of the following is *not* considered to be of concern if present in a small child?
    a). In toeing
    b). Genu varus
    c). Pes planus
    d). Bilateral genu valgus
13. Which of the following is *not* a risk factor for obstetrical brachial palsy?
    a). Overweight baby
    b). Baby following breech birth
    c). Baby delivered after a prolonged second stage of labour
    d). Baby delivered following an emergency caesarean section
14. Which of the following is *not* a treatment option routinely considered for obstetrical brachial palsy
    a). Regular assessment of range of movement and muscle power
    b). Passive stretches to prevent muscle and joint contractures
    c). Electrotherapy (ultrasound, interferential)
    d). Weight-bearing exercises through the affected limb
15. The most frequently encountered contractures are found in the.
    a). Hip flexors
    b). Knee extensors
    c). Wrist flexors
    d). Cervical side flexors
16. When assessing function in a child with a neuromuscular condition which of the following is *not* one of the main functional areas to be tested?
    a). Lifting the head
    b). Rolling
    c). Picking objects up from the floor
    d). Standing on one leg
17. Which of the following is not a typical way for a small child to express pain?
    a). Altered sleep patterns and feeding
    b). Continuous crying
    c). Vague description and localisation of pain in the child
    d). Exaggeration of symptoms
18. Which of the following is not an indicator of an underlying spinal abnormality?
    a). Dimple in the skin
    b). Café au lait patch
    c). Small area of excessive hair growth

d). Inability of the child to sustain long sitting

19. Which of the following is a test used for screening hips in babies?
    a). Gillet test
    b). Piedallu's sign
    c). Ortolani test
    d). Tortollini test
20. Which of the following is a test used to evaluate motor function in children?
    a). GMFM-88
    b). SFC-35
    c). AMTS
    d). VRS

Acute paediatrics multiple choice answers

1. b)
2. b)
3. b)
4. b)
5. b)
6. a)
7. a)
8. a)
9. c)
10. c)
11. d)
12. d)
13. d)
14. c)
15. a)
16. c)
17. d)
18. d)
19. c)
20. a)

Chapter 2

Amputees

Introduction

- The student or novice physiotherapist may treat the 'primary' and/or the 'established' amputee.
- Where there is no on-site specialist physiotherapist available for supervision and guidance it is important that the therapist knows when, where to seek specialist support, e.g. via a regional prosthetic centre or specialist physiotherapist in the acute setting.
- This volume covers the treatment of the adult amputee with acquired lower limb amputation, with some reference to the adult upper limb amputee.
- Advice on the treatment of the child with acquired amputation or congenital absence should be sought from regional specialist centres.
- Treatment planning requires a holistic, integrated, multidisciplinary approach, enabling effective exchange of information with all involved in the treatment of the patient.
- To encourage patient adherence to rehabilitation, SMART goals for treatment must be agreed initially, between the patient and the team members involved in the patient's management.
- Ongoing evaluation by the physiotherapist (and other team members) of the amputee's ability to achieve treatment goals during the early treatment stage will assist in determining the amputee's suitability for prosthetic referral.
- Physiotherapy treatment is defined by assessment findings. Physical, personal, social and environmental factors will influence the plan and determine how attainable rehabilitation goals will be.
- The amputee and physiotherapist should consider goal setting as something to be done in partnership and the plan should include short and long-term goals.
- The International Classification of Functioning, Disability and Health (WHO 2001) model can assist the evaluation of the assessment findings (Geertzen 2008).
- It is recommended that the 'SOAP' format is used for recording treatment.
- Appendices 2.1 and 2.2 provide additional material for students.

Physiotherapy treatment goals

▲ denotes specific treatment rationale for UL physiotherapy treatment.

The prevention of postoperative complications

- This follows the same principles used for any postsurgical patient and applies to all age groups and causes of amputation.
- The amputee will be an inpatient from 1 week to several weeks, depending on the amputee's health, the service and setting and their home environment circumstances.
- The early postoperative stage is normally within the first week postsurgery.
- The aim within this week is for the patient to progress to attending the therapy gym.
  - Routine postoperative chest physiotherapy for all patient groups must be performed, irrespective of anaesthetic procedure
  - Bed mobility, e.g. lie to sit, transfers to and from a wheelchair, will facilitate and encourage full lung expansion and prevent the retention of secretions
  - Circulation exercises are encouraged to prevent problems such as deep vein thrombosis.
- ▲ Walking as balance allows.

Pain management

Early management

- Pain after amputation is common and to be expected.
- Communication and co-ordination of treatment with other members of the MDT is essential and the timing of physiotherapy treatment must coincide with pain control.
- The physiotherapist should have an understanding of prescribed pain medication and side effects (BNF 2010).
- The amputee experiencing significant postoperative pain will find it difficult to co-operate and engage with physiotherapy treatment, therefore the physiotherapist should provide reassurance and explanation of underlying postoperative pain in the residuum (RLP).
- The patient should be alerted to the possible presence of phantom limb sensation (PLS) which may include phantom limb pain (PLP) (Broomhead et al 2006).
- Information about PLS should be provided by health professionals with appropriate knowledge and training (Mortimer et al 2002).
- It should be explained to the patient that PLS is a normal response and consequence of amputation surgery, which handling, exercise and medication will help to reduce.
- This is important for the safety of the amputee who may sense their amputated limb as being present and could unconsciously attempt to weight bear through it, resulting in a fall.
- Handling the residuum helps to desensitise nerve endings, helps the remodelling of the homunculus and contributes to the amputee's adjustment to their new body image

(Ramachandran and Hirstein 1998).

- 'Stump handling' enables the amputee to apply early individual control over the management of their pain and it is important to reassure the amputee that gentle handling will not harm the wound.
- Stump handling along with daily observation is important at all stages of rehabilitation and must become part of normal daily routine for the amputee post discharge to check for skin changes resulting from pathology, prosthetic fit or positioning.

Tip!

Encourage the amputee to look at and handle their residuum as soon as possible post amputation surgery, e.g. first day postoperatively.

Handling takes place over wound dressings.

- Active exercises will encourage resolution of postoperative oedema, which can cause pain.
- Appropriate positioning of the residuum to avoid prolonged and excessive flexion must be emphasised – the patient will instinctively want to flex their residuum if it is painful, therefore maintaining full range and a good resting position is essential and must be reinforced.

Tip!

The physiotherapist must ensure nursing colleagues reinforce effective positioning and handling. A pillow should not be placed under the residuum. The transtibial amputee must use a stump board when in a wheelchair (Figure 2.1).

Figure 2.1 Correct position of residuum on stump board.

- Wound healing must be monitored daily by a team member; the physiotherapist should take the opportunity to observe the wound.

Ongoing management

- The amputee may continue to experience either RLP or PLP, or both.
- Where RLP or PLP persists, investigations should be made to identify the cause, e.g. infection, vascular insufficiency, soft tissue injury, referred pain, including joint pain, or breakdown in the myodesis.
- If pain is related to wound breakdown, physiotherapy should be carried out with caution. Exercising may provide some distraction from the pain.
- Where wound healing is compromised and contributing to pain, the use of laser therapy has been reported to be effective (Baxter 1999).
- The physiotherapist must be vigilant in monitoring and evaluating the amputee's pain and communicating this with relevant colleagues, irrespective of the stage of rehabilitation.
- Assessment findings may indicate interventions including:
  - Consolidation of residuum handling and desensitisation by the patient, e.g. massaging over stump end or painful area, tapping/percussion, contact with different materials
  - Review of medication, e.g. use of tricyclics, antidepressants and anticonvulsants
  - Use of graded motor imagery (Butler and Moseley 2003)
  - Investigations for referred pain
  - Other modalities, e.g. TENS, acupuncture.
- Reference to a 'pain pathway' can facilitate clinical reasoning and support the decision-making processes for a team approach to pain management (Appendix 2.3).
- Progressing with a general exercise programme and use of an early walking aid (EWA) will assist in the management of an amputee's phantom sensation and/or pain (Barnett et al 2009).

Improve functional mobility and balance

Early management

- Where practical, and with MDT collaboration, treatment should be on a daily basis.
- All amputees irrespective of level, age or pathology, should be suitably dressed to participate with physiotherapy, i.e. in day clothes, ideally loose-fitting skirts and trousers with elastic tops, a comfortable and good-fitting sock and shoe with non-slip sole for the single amputee when ready to transfer from bed to wheelchair.

Tip!

Amputees with poor memory or cognitive impairment may respond well to written guidance and/or diagrams for functional activities and exercise, e.g. wheelchair transfers.

Tip!

Use of cots sides, bed levers and bed ladders assist bed mobility in the early stages.

- Lie to sit practise will routinely form part of chest treatment and will aid all ADLs.
- Rolling, same rationale as for lie to sit. Incentives for basic functional movements are comfort, preparation for transfers and engaging in active exercises.
- Dynamic sitting balance is essential for transfers, dressing, toileting and ultimately walking, irrespective of level, UL or LL.

Routine balance exercises

- Challenging the amputee to reach outside base of support.
- Rhythmic stabilisations in sitting.
- Rhythmic stabilisations in sitting over the side of the bed/plinth with the remaining foot on the floor. Progress to removing contact with the floor.
- Use of sit-fit cushion, e.g. throwing/catching of ball.
- Core stability exercises.
- ▲ The UL amputee finds dressing difficult and clothes without buttons or zips make this easier.
- ▲ If the UL amputee has had an amputation of their dominant hand functional activities such as dressing, toileting, eating and writing will need to be practised with the remaining limb.
- ▲ Where possible the residual limb should participate in these normal functional activities and a range of devices can assist this, e.g. non-slip mats and a simple gauntlet.
- ▲ The bilateral UL amputee will need specific assistive tools to assist ADLs.
- ▲ A high level or bilateral amputation can affect balance. Balance exercises in sitting, standing and walking should be practised (Figure 2.2).

Figure 2.2 Balance exercise for UL amputee.

Tip!

Beware of early overuse of the remaining arm in the UL amputee.

Wheelchair provision

- Occupational therapists traditionally provide wheelchairs and cushions, in some situations it can be the physiotherapist's responsibility.
- The amputee and/or carer will need to be instructed how to use the wheelchair, including use of brakes and footplates (Broomhead et al 2006).
- All LL amputees, irrespective of age, should be provided with a loan wheelchair on the first day postoperatively.
- A standard 8 L wheelchair (17 inches × 17 inches (43 cms × 43 cms) seat size) is suitable for most adult amputees.
- In some cases a bariatric (heavy-weight) wheelchair is required for the larger amputee.
- Two- to three-inch cushions are standard.
- Where amputees are at high risk of developing pressure areas a pressure-relieving cushion is necessary.
- Bilateral and bariatric amputees need special assessment and provision.

Transfers

- This is an essential requirement for independence and meeting criteria for prosthetic rehabilitation.
- In some instances amputees will not be able to initiate independent transfers; they may be apprehensive, in discomfort or unable to follow appropriate instructions.
- A manual handling risk assessment should be carried out to identify appropriate assistive devices, e.g. sliding boards, hoists.
- All amputees need to be supervised until assessed as safe to transfer independently.

Tip!

The recommended transfer procedure for a single amputee is the standing pivot:

- Suitable foot wear
- Chair positioned at 90° to the side of the bed/plinth and to the side of remaining leg, brakes applied, footplates positioned away
- Side of wheelchair removed to ease procedure initially and assess amputee's ability
- Amputee places hand flat on seat cushion and transfers partway across
- Amputee then places hand on the side of the wheelchair to enable completion of transfer
- To return, carry out the reverse procedure
- The procedure can be progressed to a transfer without removal of side of wheelchair
- In some instances the amputee may require the use of a sliding board.

Tip!

Some examples of physiotherapy techniques to enable the amputee to transfer include increasing UL strength, e.g. use of push up blocks, balance exercises, core stability and rhythmic stabilisations in sitting.

Tip!

All bilateral amputees should be taught 'sideways' and 'forwards backwards' transfers.

Sideways transfer from bed to wheelchair is often the preferred method of transfer for bilateral transtibial amputees. Procedure:

- Wheelchair is positioned at 90° to the bed
- Arm rest is removed
- Sliding board is positioned to facilitate transfer
- Amputee places hand flat on cushion and transfers across
- Amputee moves hand across to other wheelchair side to enable completion of transfer
- To return, carry out the reverse procedure
- A therapist may be required to stand in front of the wheelchair to offer support and confidence.

'Forwards backwards' transfer from bed to wheelchair is often the preferred method of transfer for bilateral transfemoral amputees:

- The chair is positioned face on to the bed/plinth, brakes applied
- The amputee bottom shuffles backwards onto the wheelchair using the arm rests to assist
- To return, carry out the reverse procedure
- A therapist may be required to stand behind the wheelchair to provide confidence to the amputee (Figures 2.3 and 2.4).

Figure 2.3 Transfemoral wheelchair drill.

Figure 2.4 Forward backwards wheelchair transfer.

- All transfer procedures can be applied and progressed in relation to setting, e.g. toilet, car.

Tip!

The younger amputee may express frustration with mobilising in a wheelchair and will want to hop with or without crutches. The physiotherapist must explain the importance of minimising hopping, as this will impact on the resolution of oedema and could increase the risk of falls.

Ongoing functional ability and balance

Core exercises

- Core exercises have an important role in the treatment of all amputees, UL and LL, whether they progress to rehabilitating with a prosthesis or remain as an independent wheelchair user.
- Despite limited research into the benefits of 'core stability' exercises in amputee rehabilitation, it is felt that core stability is essential when using a prosthesis or wheelchair.
- Progression with these exercises will be dependent on the amputee's cognition, exercise tolerance and ultimate level of activity.
- The independent wheelchair user will benefit from simple mobilising and strengthening exercises (PIRPAG 2005).
- Working closely with OT colleagues, treatment should focus around achieving good dynamic sitting balance to enable independent ADLs and transfers.
- To progress this, more challenging balance exercises can include:
  - Use of the gym ball (Figure 2.5)

  – Group games to encourage more dynamic balance reactions, e.g. badminton, indoor bowls
  – Use of Nintendo Wii Fit sport, sitting in wheelchair.
- The prospective limb wearer will benefit from all the above and should be further progressed to incorporate treatments that challenge their balance in an ever-decreasing base of support.
- Progression can include:
  – 4-point kneeling
  – 2-point kneeling
  – Rhythmic stabilisations
  – Progression with Gym ball
  – Use of Nintendo Wii Fit.

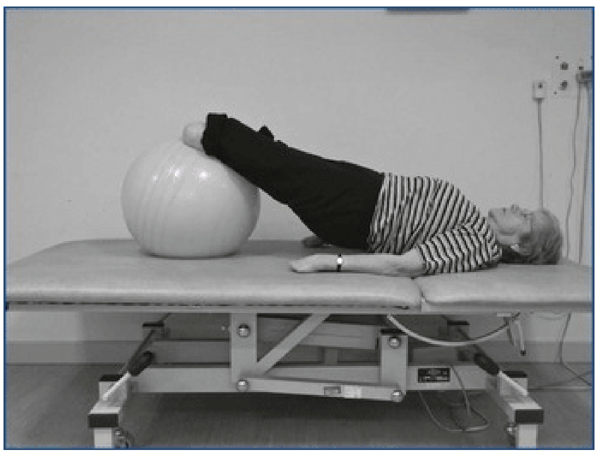


Figure 2.5 Gym ball exercise.

Maintain and increase joint range

Early management

- When the amputee is ready to attend the therapy gym, provided it is practical and safe to do so, he/she should be encouraged to make their own way in their wheelchair.

Tip!

Using a wheelchair is an excellent way for the amputee to mobilise and strengthen their arms.

- Active exercises for the remaining and residual limb maintain joint range, improve circulation and wound healing, reduce residual oedema and prevent postoperative complications, e.g. deep vein thrombosis.

- It is important for the amputee to appreciate that the responsibility for practising exercises is theirs for achieving and maintaining functional mobility and independence.
- Frequent exercise practice should be encouraged, i.e. daily exercise sheets designed specifically for the patient can facilitate commitment to exercise.

Tip!

For examples of standardised exercises for lower limb amputees refer to Physiotherapy Inter Regional Prosthetic Audit Group exercises (PIRPAG 2005).

- The same principles of exercise apply to the UL amputee:
  - ▲ Active exercises for the UL amputee should concentrate on all movements of the shoulder joint and shoulder girdle, i.e. elevation, depression, protraction and retraction, as these are important to enable the amputee to operate a prosthesis
  - ▲ The bilateral UL amputee may have to use their lower limbs, chin, neck and trunk to perform some ADLs and therefore maximising active ROM of all these joints is essential.
- Use of EWAs is another way to maintain joint mobility.

Prevention of contractures

- The promotion of active stretching through positioning and the adaptation of certain exercises will assist in preventing contractures (Figure 2.6).
- Encourage the transfemoral amputee to lie supine each day, to prevent hip flexion and abduction contracture following prolonged sitting or as a consequence of pain.
- For transtibial amputees the use of a ‘stump board’ on the wheelchair will help prevent a knee flexion contracture.
- ▲ There is a tendency for the UL amputee to acquire a posture of internal rotation of the glenohumeral joint, cervical lordosis and side flexion to the affected side; trunk side flexion to the affected side with minimal arm swing (of the residuum); and trunk rotation in walking.
- ▲ Encouraging early attention to posture in sitting, standing and walking will help prevent loss of range and contractures.

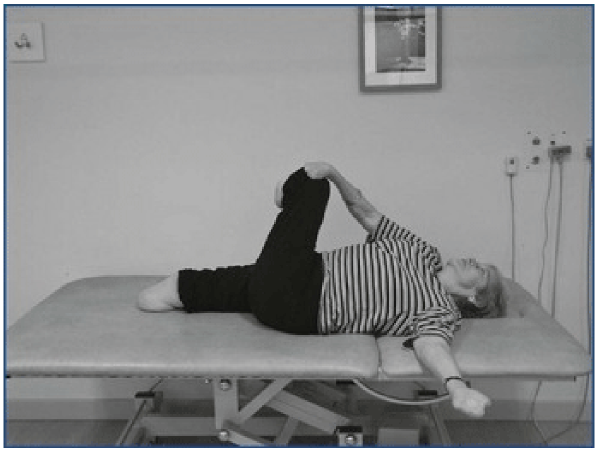


Figure 2.6 Stretches.

Tip!

Encourage the UL amputee to regularly move their neck, trunk and both shoulders through available ranges on a daily basis.

Maintenance and increase in muscle strength

- Considerations for progressing exercise will include the level and cause of amputation, PMH, age and goals.
- Exercises should be designed and graded to achieve progression, incorporating strengthening, joint mobility and endurance.
- The amputee needs to have good endurance of both muscles and cardiovascular system in preparation for prosthetic mobility (Waters and Mulroy 2004).
- The older amputee will require an exercise programme of a more repetitive nature, whereas the younger amputee will require greater variation, challenge and resistance training (Velzen et al 2006).

Tip!

Cardiovascular demand will depend on the level of amputation. The physiotherapist must be mindful of the associated risk of resisted exercises with cardiac compromised amputees.

- Techniques and equipment include:
  - Manual resistance e.g. PNF, rhythmic stabilisations
  - Resistive equipment, e.g. pulley systems, weights, variable resistance equipment such as motomed and Thera-Band (Figure 2.7)

– Progression of resistance to include power and endurance training.

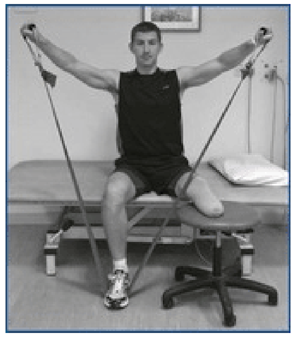


Figure 2.7 Exercise with Thera-Band.

Tip!

The physiotherapist must be aware of the risk of overuse injuries when setting treatment plans.

Tip!

Consider the anatomy of the residuum and the potential for muscle imbalance in relation to surgical technique, e.g. the predisposition for flexion contracture in the knee disarticulation and trans-femoral amputee.

The hip flexors iliopsoas are not affected surgically.

Oedema management

- Early control of oedema is important as it relates to many treatment goals, e.g. wound healing, pain management, successful prosthetic fitting and functional mobility.

Early oedema management

- Approaches include elevation and correct positioning postoperatively, i.e. supine on the bed without a pillow under hip or knee, in addition to consistent use of stump board with wheelchair for the transtibial amputee.

Tip!

Don't forget that the tall amputee or longer transfemoral/knee disarticulation amputee also requires a stump board.

Active exercises

- A helpful exercise, often forgotten, is isometric contraction of anterior and posterior tibials and gastrocnemius muscles in the transtibial amputee, i.e. dorsi and plantar flexing the phantom foot.

Use of compression therapy

- There must be caution when applying compression therapy.
- During the first week wound dressings are kept in place by 'TubiFast', a lightly elasticated material, which exerts gentle compression (Mölnlycke 2010).
- There are different sizes of TubiFast for different levels of amputation, e.g. the 'blue line' is most commonly used for transtibial amputees.

Tip!

Ensure the applied TubiFast is sufficiently long to prevent rolling down over the knee or indenting mid thigh in the transfemoral amputee.

- There is no current evidence to indicate when to start using 'compression socks'.
- Practice varies as to who decides if and when it is indicated, it may be the physiotherapist, the vascular nurse specialist, the surgeon or the rehabilitation consultant.
- A compression sock should be used in preference to elastic bandages (Broomhead et al 2006).
- The type of compression is decided according to assessment findings, wound healing, presence of infection, vascularity and patient compliance (Van Ross et al 2009).
- Where a compression sock is indicated, the correct size is a prerequisite, e.g. the 'Juzo' sock includes manufacturer's instructions for measuring to ensure the correct size.
- Additional advice and precautions for their use should be sought from regional prosthetic centres.
- The amputee must understand the correct use and application.

Tip!

Bandaging is no longer a recognised method of oedema control in the lower limb vascular amputee.

Ongoing oedema management

- The presence of oedema will continue to fluctuate for some time, in some cases up to a year or more.
- This can be due to pathological or metabolic causes, e.g. cardiac disease, poorly controlled diabetes.
- Oedema may persist because of the patient's own management, e.g. a lack of compliance with use of stump board and/or compression therapy.
- Amputees who choose to hop rather than use a wheelchair are more likely to present with

fluctuating oedema.

Tip!

In cases where oedema persists and is problematic, e.g. delaying healing and/or prosthetic provision, the physiotherapist should monitor this via measurement and observations, provide patient education and refer to medical colleagues where there is a medical cause.

- ▲ The UL amputee is encouraged to assist reduction of oedema through active exercises and maintain elevation of the residuum via pillows postoperatively, when lying or sitting, or through supportive suspension from a drip stand.
- ▲ Smaller sizes of compression socks may assist; however, in some cases where oedema is slow to resolve, e.g. lymphoedema, careful use of an elastic compression bandage may be indicated.

Scar management

- In cases where oedema or wound infection persists and healing is delayed in the transtibial amputee, scars can become adhered.
- Treatment includes stretching, micromassage to the area and surrounding soft tissues, and application of moisturising creams, e.g. E45.

Mobilisation with early walking aid to prepare for prosthetic mobility

EWAs

- EWAs are examples of specialist equipment and guidelines recommend that therapists should be familiar with their use (BACPAR 2008).
- The use of EWAs as a form of mobility can be indicated as early as 5 to 7 days post-amputation.
- This will enable a LL amputee to stand and mobilise partial weight bearing as part of the assessment and in preparation for prosthetic mobility.
- The physiotherapist introduces sit to stand practice, followed by weight transference in standing, progressing to mobilising.
- Endurance is developed in terms of cardiovascular conditioning and residuum tolerance to weight bearing and pressure.
- In addition to enabling the amputee to prepare for prosthetic mobility, EWAs can provide a psychological boost allowing the amputee to recognise that walking is possible again.
- Early walking is not an activity performed in isolation; it must be combined with other aspects of physiotherapy, e.g. PIRPAG exercises, balance and core work.
- The period of mobilisation using an EWA can be from 1 week post amputation up to an

average of 3–4 weeks.

- In some situations this may be prolonged while awaiting referral to the prosthetic centre or while residual oedema slowly resolves and the residuum heals.

The Pneumatic Post Amputation Mobility Aid (PPAM Aid)

- The PPAM Aid is a popular low-cost tool to assist single leg early transtibial, knee disarticulation and transfemoral amputee pre-prosthetic mobility (Figure 2.8).
- It consists of a metal frame (available in four different sizes and heights), an outer and inner pneumatic sleeve/bag.
- There are two outer bags, one for the transtibial and knee disarticulation levels, the other for the transfemoral.
- The stump is suspended through inflation of the bags within the metal frame.
- Inflation must be through a calibrated pump with the outer sleeve being inflated to 40 mmHg to allow partial weight bearing.
- As the amputee walks in the PPAM Aid the pressure increases and decreases alternately, stimulating circulation and oedema resolution.
- Initially amputees may only tolerate sitting in the PPAM Aid for the first session, they should be progressed to daily mobilisation for periods of up to an hour or more at a time.
- It must be remembered the PPAM Aid is a partial weight-bearing device for indoor use and requires the amputee to be supervised as their mobility progresses from the parallel bars to using crutches (Dawson et al 2007).
- There is recent evidence illustrating that mobilising with a PPAM Aid promotes healing in a wound that would otherwise require further surgery, leading to successful prosthetic rehabilitation (Van Ross et al 2009).
- As a matter of course, wounds and residuums should be inspected before and after using the PPAM Aid.
- If soiled during use it must be cleaned after each application and again thoroughly once the amputee starts prosthetic mobility.

Figure 2.8 PPAM aid.

Tip!

Cautions with using of the PPAM Aid include:

- Ischaemic wound
- Pain
- Grossly infected wound
- Hip and knee flexion contracture
- Bilateral transfemoral amputee with or without a prosthesis
- Cognitive impairment
- Short transfemoral residuum which prohibits suspension.

- The manufacturer of the PPAM Aid provides additional useful information on their website (www.ortho-europe.com).

The Femurett

- This is an alternative EWA for the transfemoral amputee. It consists of three sized sockets, a thigh component with simple uniaxial knee, a shin tube and a foot (Figure 2.9a, b).
- The lengths of the components and the size of the sockets can be adjusted to suit individuals.
- This is a partial weight-bearing tool for use within a physiotherapy department under supervision only.
- The same principles of progression, wound and residuum care, and equipment management as for the PPAM Aid, apply.
- The manufacturers of the Femurett provide additional useful information on their website (www.ossur.co.uk).

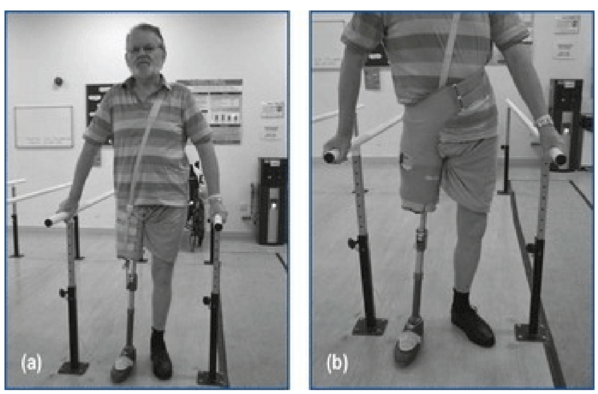


Figure 2.9 (a) Femurett. (b) Femurett with additional suspension from a Tesbelt.

Tip!

Indications for mobilising with the Femurett:

- Used for transfemoral amputees.
- A short and/or flexed transfemoral residuum unable to tolerate the PPAM Aid.
- If an amputee is considered to be 'borderline' with respect to potential for prosthetic mobility, the Femurett can be a useful assessment tool as the construction in terms of weight and socket design bears greater similarities to a basic transfemoral prosthesis than the PPAM Aid.

Tip!

Considerations for the bilateral amputee using an EWA:

- An EWA should not be used for a bilateral primary amputee, unless the amputee was previously a prosthetic user as a single amputee and uses a prosthesis in conjunction with the EWA.
- In the case of a bilateral transfemoral amputee, advice should be sought from a specialist centre with respect to the appropriate use of EWAs.
- To reduce energy expenditure, ease sit to stand and improve balance, it is recommended that the existing prostheses are reduced in height.

Prosthetic referral

- Within the first few weeks post surgery it will become apparent if an amputee is suitable for prosthetic referral.
- Fundamental criteria need to be considered in the decision-making process of whether an amputee will be able to use a prosthesis functionally and safely:
  - The residual limb wound must be healing – an unhealed wound may compromise prosthetic prescription
  - The amputee must be able to understand and remember instructions – this is an issue of safety
  - The amputee must demonstrate independent transfers to and from a wheelchair – reflecting safety and the ability to function independently
  - Independent wheelchair mobility indoors – as above
  - The amputee must be able to push up from sitting to standing independently within parallel bars and remain standing, using the bars demonstrating strength, endurance and balance
  - Wound healing permitting, the patient should be able to mobilise with an EWA – this challenges strength, balance, co-ordination and cardiovascular tolerance.

The non-prosthetic user

- The decision to refer an amputee for prosthetic referral should be made by the MDT in agreement with the amputee.
- The physiotherapist's evaluation of the amputee's ability to achieve treatment goals will influence this decision.
- The decision not to use a prosthesis may be the amputee's own choice, or failure to meet the criteria.
- Not all amputees will proceed to prosthetic rehabilitation, e.g. prosthetic outcomes for older dysvascular amputees are poor (Callaghan and Condie 2004; Cumming et al 2006; Davies and Datta 2003).
- In situations where an amputee does not fully meet the centre's required criteria, but is motivated to walk, a review appointment may be made to reassess potential.
- This agreement should be known to all relevant members of the team and the physiotherapist in the referring team should plan and co-ordinate treatment accordingly.
- For patients not proceeding to prosthetic rehabilitation there must be collaboration with OT colleagues to ensure they become safe and independent wheelchair users within their home setting or identified discharge destination.
- Physiotherapy should include an exercise maintenance programme, e.g. the future potential for a transtibial amputee to achieve prosthetic mobility will be compromised if a knee flexion contracture develops through insufficient rehabilitation; additionally there is the potential for a flexed residiuum of a non-ambulant transtibial amputee to break down due to excessive distal pressure applied via the stump board or bed.
- Discharge planning involves appropriate MDT input during home visits with referral to social services or intermediate care services (ICT) to provide ongoing support as required.
- ▲ The upper limb amputee is likely to be discharged earlier, i.e. within the first week.
- ▲ Referral to the prosthetic centre for assessment must be made in good time.
- ▲ A visit to the centre may or may not include specialist physiotherapist advice about posture management, normal movement and prevention of problems, e.g. overuse of remaining arm, reduced trunk rotation and arm swing, symptoms related to poor body image, lack of confidence and pain.
- ▲ This advice should be provided prior to discharge from the acute setting.
- ▲ Prosthetic rehabilitation focuses on function and cosmetic use involving working between the OT and the physiotherapist to prevent and manage physical limitations.

The prosthetic user

- Early referral to the regional specialist centre (within the first week post-amputation) allows the initial appointment to coincide with the amputee's residuum being ready for prosthetic measurement.
- Early referral gets the patient into 'the system'; if not 'ready' for the first appointment it can be postponed.
- A physiotherapy report should accompany the referral, highlighting the amputee's ability

to meet specified criteria.

- The first appointment at the specialist centre will vary; it may be as soon as 2–3 weeks post-amputation or longer.
- While waiting for this appointment the amputee may be discharged home or to an appropriate alternative setting.
- During the period between discharge and prosthetic assessment supervised physiotherapy must continue either via outpatient sessions or in the amputee's home via the community service.
- Assessment at the specialist centre will be based on the referral and findings from the prosthetic MDT.
- The specialist physiotherapist in the centre may be asked to assess the patient to affirm referral information.
- The conclusion of the primary appointment in most cases is a prosthetic 'prescription'. Arrangements will be made for the amputee to be measured and subsequently fitted with their prosthesis.

Prosthetic mobility

- Following prosthetic prescription the amputee will commence gait re-education or 'gait training'.
- This may take place in a variety of settings and follow different pathways. The amputee may return to the specialist centre for 'fitting' and engage in daily sessions in the centre's physiotherapy department.
- Alternatively, following prosthetic fitting, the amputee may attend their local outpatient physiotherapy department where frequency of sessions will depend on the available service.
- Treatment continues until safe, independent functional use of the prosthesis is achieved. This can last several weeks.

Gait re-education in the lower limb amputee, aims and objectives

- Gait describes the manner or style of walking, e.g. three-point gait.
- Overall, the purpose of physiotherapy at the prosthetic stage is to enable the amputee to mobilise with a prosthesis with minimal effort, adequate stability and have an acceptable appearance (Hagberg et al 2007, Velzen et al 2006).
- The physiotherapist should have an understanding of the following:
  - Normal gait (Whittle 2007)
  - Factors that influence efficient walking
  - Factors that affect the outcome of successful prosthetic use
  - The stages of prosthetic gait re-education

– The use of relevant outcome measures.

- There is a consensus in the literature that there is an increase in energy cost as levels of amputation become higher (Waters and Mulroy 2004). This is linked to the excursion of centre of mass from the norm, which is influenced by the level of amputation, skeletal links and muscles.
- Other physical factors affecting walking efficiency and successful prosthetic use include the presence of co-morbidities, the extent to which the prosthetic replacements mimic the original body parts and the interface between the body and the prosthesis (Schmalz et al 2002).
- Psychosocial influences include: personal motivation, social support and level of cognition.

Stages of gait re-education

- All previous treatment goals relate to gait training in terms of preparation. Aspects of techniques outlined previously are relevant to the various stages.
- Prior to gait re-education the physiotherapist should acquaint themselves with the prosthesis, understanding the fit of the socket, how the prosthesis is suspended on the amputee and how the components function (Divers and Scott 2005).

Tips!

Considerations for goal setting

i. The older amputee:

- Safety
- Function within limitations
- Increased risk of falls
- Prosthetic rehabilitation may be prolonged

ii The younger amputee:

- Aim to obtain the best possible gait pattern
- Do not remove walking aids too quickly
- Concurrent exercise programme to ensure strength and mobility (Velzen et al 2006)
- Goals to relate to school, work, sports and hobbies.

- Prior to assessing and commencing gait re-education, reference should be made to relevant patient notes or reports; if further clarification is needed this should be sought from the specialist prosthetic centre.

Donning and doffing the prosthesis

- This is a critical initial stage and goal for the patient to be able to progress to walking.
- Assessment may identify limitations in hand function and/or dexterity that will influence

the amputee's ability to do this, e.g. RA.

- An amputee's ability to follow instructions, problem solve and carry out processes are also important.
- At this stage physiotherapy will concentrate on:
  - Hand function
  - Dynamic sitting balance
  - General upper limb strength
  - Repetition and practice.
- Modifications to prosthetic suspension should be explored as necessary to aid donning and doffing, e.g. the use of velcro to replace buckles.
- The physiotherapist must explain the correct procedure for donning and doffing, supervising this to ensure the amputee understands how the prosthetic socket and liner fits and when alterations are required to maintain correct fit (Figure 2.10).
- With the exception of the transpelvic and some transfemoral levels, most sockets require a liner of some kind.
- Poor prosthetic fit and/or a poor donning/doffing technique can result in a damaged residuum.
- The amputee must regularly inspect the skin of their residuum.
- To achieve a comfortable and effective prosthetic fit, appropriate use of 'stump socks' is crucial.
- The amputee is given a supply of cotton socks at fitting. These come in varying lengths, widths and thicknesses to suit the individual amputee.
- Amputees must learn to alter the number and/or thickness of socks to ensure the correct prosthetic fit.

Figure 2.10 Teaching a patient how to donn a prosthesis.

Sit to stand, transfers and standing balance

- Physiotherapy concentrates on:

- Upper and lower limb strength
- Balance (Velzen et al 2006)
- Weight transference with manual facilitation and stepping practice (Gailey and Clark 2004).

Walking

- Gait re-education commences within parallel bars progressing to appropriate walking aids, in- and outdoors as relevant.
- The natural progression is through sit to stand, transference of weight through step practice, to walking.
- The physiotherapist should use the skills of close handling, facilitation of weight shift, verbal prompting and biofeedback, e.g. full-length mirror.
- Once the amputee is confident and safe to walk independently within the parallel bars the physiotherapist can begin to observe and analyse the gait pattern to identify existing or potential gait deviations.

Gait analysis

- The physiotherapist uses their skills of observation to identify the cause of any presenting gait deviation. The use of video or access to the facilities of a gait laboratory can assist this.

Potential causes of gait deviation include

The amputee, e.g. physical limitations in strength, joint range of movement, pain.

- Physiotherapy treatment of 'amputee' causes include:
    - Strengthening exercises for identified weak muscle groups
    - Stretching of flexion contractures
    - Exercises to increase joint range of movement
    - Balance exercises
    - Pain management
    - Improving confidence.
- Physiotherapy treatment modalities may include (Gailey et al 2004):
    - PNF
    - Resisted walking, manually and with use of theraband (Figure 2.11)
    - Rhythmic stabilisations
    - Weight shifting in all planes
    - Step ups
    - Trunk work.

Figure 2.11 Resisted walking.

Prosthetic cause of gait deviation

- Accurately assessing a prosthetic cause is a specialist skill; however, there are some broad areas to consider and identify in the overall judgement of the cause of a gait deviation; and this information must be relayed back to the specialist rehabilitation centre for review.
- Potential prosthetic causes may include (Appendices 2.4 and 2.5 for 'prosthetic checkout' procedures):
  - Uncomfortable socket fit
  - Length discrepancy
  - Amputee changes shoes, i.e. heel height impacts alignment
  - Incorrect prosthetic alignment
  - Poor suspension.

A combination of amputee and prosthetic, e.g. flexion contracture and long prosthesis

- The amputee's past habitual walking pattern, e.g. stooped, toe walkers.
  - This is a question to ask of the amputee or a relative, as this is infrequently observed preamputation. Recognition of any habitual gait deviation should be accommodated within both the prosthetic prescription and physiotherapy treatment.
- Uneven timing and/or step length, i.e. commonly a longer prosthetic stride.
  - This is the most common gait deviation.
- Circumduction/abducted gait.
  - Commonly caused by pain in groin area (transfemoral), a length discrepancy between prosthesis and remaining leg/prostheses, or the transfemoral amputee's inability to hip hitch effectively with a locked knee prosthesis.

- Lateral trunk bend.
  - Commonly triggered by removing walking aids too soon in the younger amputee.
- Reduced trunk rotation and arm swing.
- Vaulting.
  - Raising of the heel on the contralateral foot, common in transpelvic levels.
- As the amputee gains in confidence and ability through practice within the parallel bars they can progress to the use of walking aids, firstly within the bars and then beyond.
- The support of parallel bars can mask gait deviations and progression to walking aids may demonstrate gait deviations not previously observed. Addressing these will follow the same treatment approach.

Functional walking and activities

- The ultimate goal for the amputee, physiotherapist and OT is using a prosthesis for functional tasks with the prospect of participating in ADLs, social activities, work, hobbies, sport and leisure.

Steps, stairs and kerbs

- Initially for all levels, the amputee will be taught to ascend leading with their non-prosthetic leg and to descend leading with their prosthesis, ascending and descending one step at a time.

Tips!

Some transtibial amputees will eventually manage stairs reciprocally, i.e. leg over leg.

Some transfemoral amputees, if their prosthesis has a yielding prosthetic knee, can be taught to descend reciprocally.

Advice should be sought from specialist centres.

Slopes

- Similar to steps and stairs in that the non-prosthetic leg leads the ascent and vice versa for descent.
- However, some transfemoral amputees will prefer to do this facing sideways, in the same manner as described with non-prosthetic leg leading the ascent etc.

Different surfaces, e.g. carpet, grass, rough ground

- Amputees need to be exposed to different terrains in- and outdoors, incorporating this into treatment sessions.
- Walking outdoors allows the amputee to experience many other factors such as weather conditions, e.g. wind, noise, traffic, crowds.

Cars, public transport, out and about

- Practising transfers in and out of a car, getting on and off a bus, an escalator and a train will be advanced skills but necessary for some amputees.

Home and work environment

- Treatment should include opportunities to walk and perform everyday functional tasks as relevant, e.g. making a meal in the kitchen, working at a desk, gardening.
- The physiotherapist needs to work closely with OT colleagues within the hospital setting or social services and/or ICT.
- The physiotherapist may need to refer to an employment re-ablement officer directly or via OT if the amputee is returning to previous work which is assessed as physically problematic.

Management of falls

- The likelihood of the amputee falling during rehab and at home is high. Studies describe the incidence of amputees falling as 20–53% (BACPAR 2008).
- Many health care organisations have a falls policy and/or advisor who can assist the physiotherapist in assessing and monitoring risk factors.
- Physiotherapy interventions addressing strength, balance, endurance, proprioception, pain and the provision of appropriate walking aids are key in falls prevention. The physiotherapist should also be aware of the influence of medical management, e.g. effects of medications and environmental modifications on falls.

Teaching the amputee to get on and off the floor safely

- This procedure should be incorporated into treatment sessions.

Forward backward chaining

- Using available equipment the amputee is taught to lower themselves gently from the plinth to a lower surface and then the floor (Figure 2.12).
- To return to the plinth the reverse procedure must be practised.
- This skill can be used by the amputee who needs to ascend and descend stairs at home without a prosthesis.

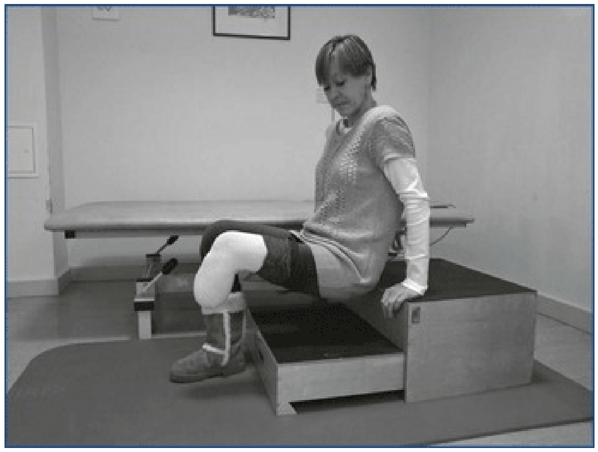


Figure 2.12 Forward and backward chaining.

Kneeling

- Having reached the floor using the chaining method the amputee is shown how to kneel with their prosthesis (transtibials and knee disarticulation amputees can kneel without a prosthesis) followed by positioning themselves in front of a secure surface, e.g. plinth.
- Whilst kneeling through their amputated side they can use their remaining leg to push up and rise from the floor (Figure 2.13).

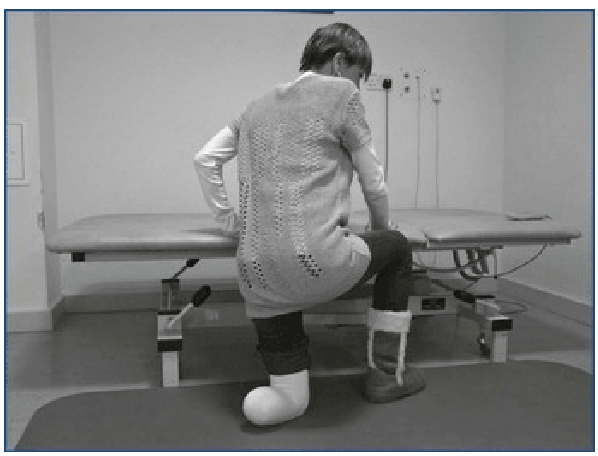


Figure 2.13 Getting up from the floor.

Tip!

This is the opportunity to discuss with the amputee how this can be managed at home.

Provision of patient information

- The physiotherapist must ensure the amputee understands the reason for their treatment at all stages.
- Some amputees will benefit from written material, e.g. transfer procedure, falls guidance. Relevant information will reassure, encourage understanding and compliance and promote realistic goals.
- Provide information gradually; beware of information overload and raising unrealistic expectations.

Tip!

Many amputees will seek 'information' from the web.

Some information may be misguided and physiotherapists should encourage the amputee to discuss their individual needs when attending their specialist centre.

- Regional prosthetic centres will have written information for the amputee, e.g. introducing the centre, stages of rehabilitation, benefits and entitlements, user support groups (Appendix 2.6), advice on driving.

Roles and responsibilities of the MDT

Medical

- Physiotherapy assessment can help inform medical colleagues with regard to level selection and potential prosthetic outcome.
- There should be communication with the vascular/orthopaedic surgeon regards referral to prosthetic centre, wound healing and commencing EWAs.

Prosthetist

- In prosthetic centres the physiotherapy liaises closely with the prosthetic department around prosthetic fit and comfort, alignment and gait.
- Physiotherapists working outside prosthetic centres are encouraged to find out how to contact their patient's prosthetist with prosthetic queries.

Nursing

- Monitoring of wound healing.
- Timing physiotherapy around dressings and pain medications.
- Pressure care for remaining foot.
- Encourage amputee's family to provide suitable clothing and footwear.
- Reinforcing the rehabilitative nature of postamputation management.

Occupational therapist

- Where possible and practical a joint therapy assessment can be performed with the OT who will have a focus on the following points:
  - Provision of wheelchair within 24–48 hours postamputation surgery
  - Cognitive tests in some instances
  - Transfer practice
  - ADLs, e.g. washing and dressing practice
  - Early access home visit.

Clinical psychologist/counsellor

- The psychologist/counsellor can advise the physiotherapist in terms of communication style and approach to facilitate adjustment and compliance.

Dietician

- Advice regarding weight management, nutrition for wound healing and exercise.

Orthotist

- Assessment of the remaining foot may highlight need for referral to the orthotist to provide the patient with orthotics and/or special footwear such as a pressure-relieving ankle foot orthosis (PRAFO) (Figure 2.14).

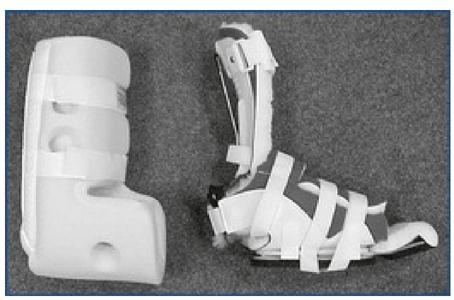


Figure 2.14 PRAFO or pressure-relieving ankle foot orthoses and heel protection.

Medical social worker

- Following assessment and the formulation of treatment goals the social worker has an important role in early preparation for discharge.
- The amputee can benefit from meeting a social worker in the early post-operative stage to discuss concerns they may have about income, benefits and entitlements, current accommodation, future ongoing care and dependants.

Specialist nursing and medical practitioners

- Tissue viability nurse specialist.
- Plastics dressings clinic.
- Diabetic, vascular, orthopaedic and pain clinic staff.
- Dermatologist, rheumatologist.

General considerations

The transtibial amputee

- This is the most common level of amputation and is recommended for a child as the tibial epiphyseal growth plate is retained.
- It is not an optimal level for a hemiplegic patient with high tone; the tendency to flexion contracture is greater and will compromise prosthetic mobility.
- This level allows optimal mobility and function as the knee joint with its proprioceptive properties is preserved.
- Energy consumption is small and a good gait pattern with the minimum of deviations should be aimed for.
- Ultimately the use of walking aids is minimal.
- The most common prosthesis is the patellar tendon bearing prosthesis (PTB). It is cosmetically acceptable and can aid transfers for the non-ambulant amputee.
- For amputees who present with a painful and/or unstable knee joint, a fixed flexion deformity of the knee joint, excessive scar tissue or lack of sensation there are prosthetic alternatives to the PTB, e.g. Thigh Corset Prosthesis/'Number 8' and the 'Above Knee/Below Knee pylon', along with bespoke liners to accommodate desensate or scarred residuums.
- The nature of the conventional transtibial prosthetic fit is intimate to ensure correct loading and the avoidance of pressure on sensitive areas.
- Amputees must appreciate weight-tolerant and -intolerant areas in their residuum and have a good understanding of the correct use of stump socks and socket fit.
- The presence of oedema before, during and after gait re-education must be managed through the correct use of compression and stump socks, e.g. compression socks must be used when not wearing a prosthesis.
- Poor understanding and management of this can result in unwanted pressure, shear forces and skin breakdown.
- The amputee must learn to take responsibility for regularly checking their residuum; self-management is an important aspect of gait re-education.
- A commonly observed problem during gait is a quadriceps lag, in particular vastus medialis, which may be related to knee pain experienced prior to achieving tolerance to weight bearing through the prosthesis.

- Suggestions for management are:
  - Step practice
  - Use of mirror/video feedback
  - Gradual progression of tolerance to the prosthesis through time, wearing and walking practice to avoid soreness and tissue breakdown
  - Resist relinquishing walking aids too early.

The knee disarticulation amputee

- Appropriate for the nonprosthetic user (single or bilateral). Benefits include a whole lap to rest things on in sitting and a weight-bearing residuum which can assist the single amputee with transfers.
- This level is favoured over a transfemoral level in children as the retained epiphyseal plate allows the residuum to continue growing and results in a residumm of good length when the child reaches physical maturity.
- The appearance of a knee disarticulation prosthesis can be poor cosmetically with a longer 'thigh' than the remaining limb and consequently a shorter shin when sitting where the foot may not reach the ground.
- However, as prosthetic componentry advances, appearance and gait outcomes are improving.
- This level retains intact muscle balance, thereby providing a strong lever.
- The ability to prosthetically end bear depends on full hip extension and exercise programmes should reflect this.
- The length and strength of the residuum impacts on gait re-education, i.e prosthetic stride length must be modified to facilitate step through of remaining limb.
- Suggestions for managment:
  - Preprosthetically, preparation for loading can start with four- and two-point kneeling and loading through a stool in the parallel bars with decreasing amounts of support
  - Attention to stride length
  - Biofeedback.

The transfemoral amputee

- A common level for the elderly dysvascular amputee:
  - Weak hip extensors and short residuum impact on gait re-education and require the physiotherapist to maximise range of movement and muscle strength
  - Energy consumption at this level is high, and therefore exercise tolerance and gaining endurance takes time
  - Upper limb strength, hand strength and dexterity influences ability to donn and doff, and sit to stand.
- Prosthetic prescription will influence gait re-education.

- The locked knee gait requires the amputee to control stride length and to learn to hip hitch to avoid circumduction.
- Suggestions for managment:
  - PIRPAG hip-hitching exercises in lying and sitting and in standing with facilitation and manual resistance over iliac crest (PIRPAG 2005)
  - Biofeedback.

'Free' knee amputee

- The physiotherapist must have a sound understanding of the mechanics of the relevent components, e.g. swing phase is control by alignment, pneumatics or hydraulics (Divers and Scott 2005).
- The inexperienced physiotherapist should liaise directly with the amputee's prosthetic centre.

Transpelvic amputees

- An uncommon level of amputation, with the commonest cause being sarcoma. Consequently prognosis, simultaneous treatment, e.g. chemotherapy/radiotherapy may influence physiotherapy goals.
- The prosthesis for amputees at this level is bulky with three prosthetic joints and no residuum to act as a lever to aid propulsion, momentum and mobility.
- Energy expenditure is high; cadence is slow with vaulting of the remaining leg a common deviation, often unavoidable in the hemipelvectomy amputee.
- Amputees often choose to combine prosthetic mobility with wheelchair and crutches.
- In the early stages of rehabilitation the physiotherapist must liaise closely with the OT around the provision of suitable wheelchair seating.
- Suggestions for management (prosthetic and/or wheelchair user):
  - Strength of back extensors and remaining leg
  - Core stability
  - Pelvic tilting
  - Balance
  - Strengthening remaining limb
  - Sit to stand ability
  - Increase endurance.

The bilateral and multiple limb loss amputee

- The main consideration for all levels of bilateral lower limb amputees is to facilitate balance and reduce energy expenditure by lowering their centre of gravity, i.e their height (Uellendahl 2004).
- Physiotherapy must include balance and core exercises with and without the prostheses

(Figure 2.15).

- The likelihood of a bilateral amputee reducing from using two walking aids when walking to one is reduced and therefore the abilty for upper limb function will be restricted.
- It is important to consider the level of mobility and function achieved as a single amputee previously, since this will influence goal setting and prosthetic prescription.

Figure 2.15 Balance exercises for the multiple amputee.

The bilateral transtibial amputee

- For the amputee who has both amputations at the same time, the use of EWAs needs to be carefully considered.
- The following recommendations state:
  - Application of one PPAM Aid and one prosthesis is an acceptable combination for gait re-education for the bilateral amputee
  - A minimum of two staff should be involved with bilateral PPAM Aid use
  - Standing only with two PPAM Aids should take place in parallel bars (Dawson et al 2007).

The mixed bilateral, e.g. transtibial and transfemoral, amputee

- If the amputee had originally been a single amputee, the use of an existing prosthesis will contribute to gait re-education.
- Ideally the prosthesis should be shortened to facilitate early mobility with the EWA.

The bilateral transfemoral/knee disarticulation amputee

- Short Rocker Pylons or 'stubbies' are used for the bilateral amputee as a method of EWA to assess ability and prosthetic potential.
- The shortened height lowers the centre of gravity assisting stability.

- These are valuable in physically preparing the amputee for articulated prostheses.

Multiple limb loss including upper limb loss

- Priority for rehabilitation may well be the achievement of ADLs and upper limb functional use, with or without an upper limb prosthesis.
- Upper limb ability will assist gait re-education, when this stage is reached.
- Adaptations to walking aids may be required and advice and provision can be sought from the specialist prosthetic centre.

Outcome measures

- Outcome measures can illustrate an amputee's progression towards personal goals.
- There are a growing number of outcome measures and it is often difficult to select which ones to use.
- For the amputee there are validated measures including (Condie et al 2006):
  - Activities-specific Balance Confidence Scale – UK (ABC-UK)
  - Amputee Mobility Predictor with a prosthesis (AMPPRO) (Gailey et al 2002)
  - Houghton Scale of prosthetic use in people with lower-extremity amputations (Devlin et al 2004)
  - Locomotor Capabilities Index 5 (LCI-5) (Franchignoni et al 2004)
  - The Trinity Amputation and Prosthesis Experience Scales (TAPES) (Gallagher and MacLachan 2004)
  - Timed Up and Go test (TUG) (BACPAR 2010).
- There are challenges in measuring outcomes in the acute setting and for the non-prosthetic user. Suggested measures would include COPM (2005) and GAS (Rushton and Miller 2002).

Referral and review of the prosthetic user

- Once initial prosthetic rehabilitation is complete decisions need to be made regarding appropriate onward referral and review.
- The amputee may require further rehabilitation within their home, school environment or work setting.
- Information in the form of a discharge report outlining rehabilitation progress and outcomes must be forwarded to the relevant professionals, e.g. community services, school staff, GP.
- Prosthetic centres arrange routine follow-up appointments where progress, prosthetic mobility, function and outcomes are reviewed.

Support for physiotherapists working in amputee rehabilitation

- Members of the Chartered Society of Physiotherapy (CSP) may join the British Association of Chartered Physiotherapists in Amputee Rehabilitation (BACPAR).
- BACPAR can provide contacts and advice for those working with amputees and aims to promote best practice in the field of amputee and prosthetic rehabilitation for the benefit of patients and the profession.
- It supports the promotion of evidence-based practice and research, is committed to education and providing a network for the dissemination of best practice in pursuit of excellence (www.bacpar.org.uk).
- The network for amputee rehabilitation is hosted on the CSP interactive site (www.interactivecsp.org.uk).

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Chapter 2

E-materials

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Author Profiles

Mary Jane Cole MSc GradDipPhys MCSP

Senior Lecturer, Practice Education, at Kingston University and St George's, University of London.

Mary Jane has worked in amputee rehabilitation in a variety of settings for many years, primarily at Queen Mary's Hospital, Roehampton, and continues to practise. She lectures nationally and internationally and has published in the speciality. Mary Jane has been Chair and Research Officer for BACPAR (British Association of Chartered Physiotherapists in Amputee Rehabilitation) and is currently Vice Chair and BACPAR representative to SPARG (Scottish Physiotherapy Amputee Research Group).

Sara Smith MCSP PGCertClinEd

GradDipPhys MCSP

Therapy Team Lead, Queen Mary's Hospital, Roehampton, London, United Kingdom.

Sara Smith has been involved in all aspects of amputee rehabilitation at Queen Mary's Hospital, Roehampton since 1987. She has been committed to the sharing of good practice through education and completed the Post-graduate Certificate in Clinical Education and subsequent ACE accreditation with the CSP. She lectures on the Roehampton 2-day and 4-day amputee rehabilitation courses and has presented at ISPO conferences and BACPAR study days.

Appendix 2.1 Amputees: glossary

ADLs – activities of daily living

Alignment (of the prosthesis) – the biomechanical set-up of the prosthesis to provide stability and as near normal gait pattern

Componentry – any part of the prosthesis below the socket, i.e. knee, ankle unit or foot

Compression sock – an elastic sock of varying lengths to aid oedema control. Brand names include 'Juzo' and 'Ottobock'

Doffing – removing the prosthesis

Donning – putting on the prosthesis

Established patient – an amputee who has completed initial rehabilitation and is returning for review for further prosthetic rehab or intervention/ therapy as appropriate

EWA – early walking aid, e.g. PPAM Aid

Femurett – early walking aid for the transfemoral amputee

Fitting – this is the appointment when the fit of the prosthesis is assessed by the prosthetist and adjustments are made as necessary before the amputee can walk with it

ICT – intermediate care team – also referred to in other terms

Liner – the inner and removable part of a socket

LL – lower limb

MSK – musculoskeletal

Multiple amputee – combination of upper and lower limb loss

Myodesis – surgical technique where the muscle groups are attached to the bone periosteum
PLP – phantom limb pain – a painful sensation in the phantom limb
PLS – phantom limb sensation – non-painful sensation in the phantom limb
PPAM Aid – pneumatic post-amputation mobility aid
PRAFO – pressure relieving ankle foot orthosis
Primary patient – a patient for whom this is their first episode of rehabilitation following amputation
Prosthesis – artificial limb
Prosthetic prescription – the type of limb selected to meet the amputee's needs
Prosthetics – artificial extension replacing a body part
Prosthetist – the health professional who makes and fits the prosthesis
Residual limb – the amputee stump
RLP – pain in the residual limb, i.e. stump
Residuum – the amputee stump
Sit-Fit – inflated balance cushion
SMART goals – specific, measurable, achievable, realistic and time framed
Socket – the part of the prosthesis that covers and supports the residuum
SRPs – short rocker pylons – short training prostheses for the bilateral transfemoral amputee
Suspension – the means by which the prosthesis maintains the correct position on the amputee
Stubbies – customised sockets, without componentry, with modified rocker ends to aid mobility; serve the same function as SRPs. The end of the socket can be shaped to accommodate the knee disarticulation level
UL – upper limb

Appendix 2.2

Name..
Student: Year ....
HEI...

Post/Band ....
Hospital/Trust...
Date..

Competence is defined as "*the possession of the necessary skills, knowledge, attitudes, understanding and experience...required to perform in professional and occupational roles to a satisfactory standard within the workplace*" (Day 1995).

The purpose of completing this self-rating form is to help guide the learning process during your placement/ rotation. It will be a useful tool for your own reflection, and to guide you **and** your clinical educator/ supervisor when setting learning objectives.

Take a few minutes at the very **start** of your placement/ rotation to consider the list of attributes (with reference to 'knowledge' and 'skills') and, using the scale, judge your current levels in the areas. Attributes have been identified in relation to learning opportunities relevant to this area of specialty, and in relation to published practice guidelines (Broomhead 2003 & 2006).

You need to **revisit** this tool by completing a new form at an agreed time; e.g. **in preparation for halfway assessment/supervision**, and at **the end of your rotation/ placement,** or more frequently as appropriate. Following completion, compare forms **–** changes will indicate where learning has occurred and where further learning needs are required; this can guide your supervision and future learning objectives.

Amputee Rehabilitation

At this point in time rate your **knowledge** and understanding of:

		weak						strong		
1. The causes of amputation	1	2	3	4	5	6	7	8	9	10
2. The principles of amputation e.g. investigations, levels, complications	1	2	3	4	5	6	7	8	9	10
3. The psycho-social aspects of amputation	1	2	3	4	5	6	7	8	9	10
4. The pre-operative management of the lower limb amputee e.g. assessment	1	2	3	4	5	6	7	8	9	10
5. The early post-operative management of the lower limb amputee e.g. assessment, oedema control, wound healing, prevention of infection, exercise therapy	1	2	3	4	5	6	7	8	9	10
6. Causes of pain, residual limb and phantom	1	2	3	4	5	6	7	8	9	10
7. The referral procedure to the limb fitting centre/DSC	1	2	3	4	5	6	7	8	9	10
8. The pre-prosthetic rehabilitation stage e.g. early walking aids, prosthetic prescription	1	2	3	4	5	6	7	8	9	10
9. The prosthetic rehabilitation of the lower limb amputee e.g. prostheses, gait analysis	1	2	3	4	5	6	7	8	9	10
10. The role (within the overall management of the amputee) of the										
Surgeon	1	2	3	4	5	6	7	8	9	10
Rehabilitation Consultant	1	2	3	4	5	6	7	8	9	10
Nurse	1	2	3	4	5	6	7	8	9	10
Physiotherapist	1	2	3	4	5	6	7	8	9	10
Prosthetist	1	2	3	4	5	6	7	8	9	10
Clinical Psychologist	1	2	3	4	5	6	7	8	9	10
Occupational Therapist	1	2	3	4	5	6	7	8	9	10
Social Worker	1	2	3	4	5	6	7	8	9	10
Dietician	1	2	3	4	5	6	7	8	9	10
11. Post-discharge management e.g. onward referral, review	1	2	3	4	5	6	7	8	9	10
12. Outcome measures (in relation to amputee rehabilitation)	1	2	3	4	5	6	7	8	9	10

Please see over…

At this point in time rate your **skills** and ability with:

	weak								strong
1. Examination and assessment of patients:									
pre-operatively	1 2 3 4 5	6 7 8 9 10							

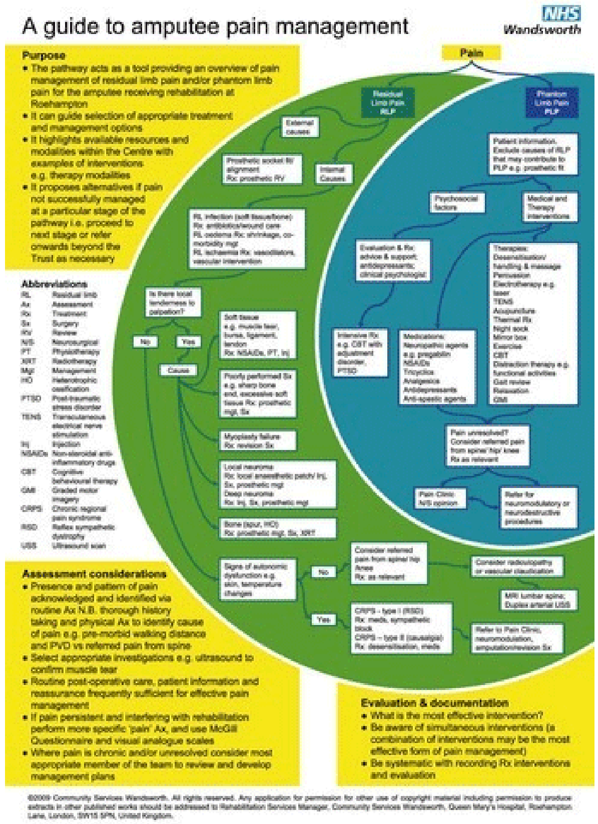
At this point in time rate your skills and ability with:	weak								strong	
1. Examination and assessment of patients:										
pre-operatively	1	2	3	4	5	6	7	8	9	10
post-operatively	1	2	3	4	5	6	7	8	9	10
pre-prosthetically	1	2	3	4	5	6	7	8	9	10
prosthetically	1	2	3	4	5	6	7	8	9	10
2. Setting appropriate and realistic goals of treatment	1	2	3	4	5	6	7	8	9	10
3. Recognising the indications for oedema control	1	2	3	4	5	6	7	8	9	10
4. Recognising the indications for early walking aids	1	2	3	4	5	6	7	8	9	10
5. Recognising complications	1	2	3	4	5	6	7	8	9	10
6. Evaluating and progressing patients	1	2	3	4	5	6	7	8	9	10
7. Equipment handling:										
Wheelchairs	1	2	3	4	5	6	7	8	9	10
Early walking aids e.g. ppam aid	1	2	3	4	5	6	7	8	9	10
Walking aids e.g. sticks	1	2	3	4	5	6	7	8	9	10
8. Patient handling:										
Transfers	1	2	3	4	5	6	7	8	9	10
Treatment	1	2	3	4	5	6	7	8	9	10
9. Pain and its management	1	2	3	4	5	6	7	8	9	10
10. Falls advice and strategies	1	2	3	4	5	6	7	8	9	10
11. Psychological support to patients and carers	1	2	3	4	5	6	7	8	9	10
12. Problem-solving e.g. challenging and complex patients	1	2	3	4	5	6	7	8	9	10
13. Gait analysis	1	2	3	4	5	6	7	8	9	10
14. Advanced prosthetic rehabilitation e.g. 'free' knee componentry, running	1	2	3	4	5	6	7	8	9	10
15. Management of the bilateral lower limb amputee	1	2	3	4	5	6	7	8	9	10
16. Management of the non-prosthetic amputee	1	2	3	4	5	6	7	8	9	10
17. Management of the upper limb amputee	1	2	3	4	5	6	7	8	9	10
18. Effective communication with other members of the MDT	1	2	3	4	5	6	7	8	9	10
19. Discharge procedure	1	2	3	4	5	6	7	8	9	10
20. Information-giving to patients/clients and carers regards the rehabilitation process	1	2	3	4	5	6	7	8	9	10
21. Evaluating and developing the service for this patient/client group	1	2	3	4	5	6	7	8	9	10

Are there any other areas, related to the management of the amputee, in terms of knowledge, skills and ability, that you feel have the potential for change and improvement? Please state and rate accordingly

	1	2	3	4	5	6	7	8	9	10
	1	2	3	4	5	6	7	8	9	10
	1	2	3	4	5	6	7	8	9	10

Broomhead, P., Dawes, D., Hale, C., Lambert, A., Shepherd, R and D. Quinlivan. 2003. *Evidence Based Clinical Guidelines for the Physiotherapy Management of Adults with Lower Limb Prostheses*. Chartered Society of Physiotherapy, London.
Broomhead, P., Dawes, D., Hancock., A., and A. Davies. 2006. *Clinical Guidelines for the pre and post operative physiotherapy management of adults with lower limb amputations*. Chartered Society of Physiotherapy, London.
Day M. 1995. Putting vocational training into practice. Cited in Alsop, A. 2000. Continuing professional development. A guide for therapists. Oxford: Blackwell Science Ltd.

Appendix 2.3



Appendix 2.4 Transtibial prosthetic checkout

Check with patient standing and walking

1. Is the prosthesis the correct length?
2. Suspension
   - Is piston action minimal when the patient raises the prosthesis?
   - If a PTB – are the down-straps tight enough and does the cuff strap maintain its position?
   - If an Iceross – is the sleeve donned correctly?
   - If a No 8 or AK/BK pylon:
     - Does the thigh corset close properly, with adequate provision for adjusting corset tension?
     - Do the uprights conform to the flares above the epicondyles?
     - Do the length and construction of the thigh corset appear to be appropriate for its intended function of weight-bearing or stabilisation?

3. Anteroposterior alignment – The patient should not feel that his/her knee is unstable nor that his/her knee is being forced back.
4. Mediolateral alignment – The shoe should be flat on the floor and there should be no uncomfortable pressure at the lateral or medial brim of the socket.
5. Comfort:
    - Is the patient comfortable in the socket?
    - What is the patient's 'Socket Comfort Score (SCS)'?

Check in sitting

- Can the patient sit comfortably with the minimal bunching of soft tissues in the popliteal region when the knee is flexed to 75°?

Check with prosthesis off

- Does weight bearing appear to be distributed over the proper areas of the residual limb?

Appendix 2.5 Transfemoral prosthetic checkout

Check in standing and walking

1. Does the ischial tuberosity rest properly on the ischial seat?
2. Is the adductor longus tendon properly located in its channel and is the patient free from excessive pressure in the anteromedial aspect of the residual limb?
3. Is the anterior wall high enough to support adductor tissues?
4. Is the prosthesis the correct length?
5. Is the patient free from vertical pressure in the area of the perineum?
6. Is the patient comfortable in the socket? What is the patient's 'Socket Comfort Score (SCS)'?
7. Suspension:
    - For Rigid Pelvic Band (RPB) – does the pelvic band accurately fit the contours of the body?
    - For Silesian suspension – are the lateral and anterior attachments of the belt correctly located?
    - For other soft suspension – is there any drop away or rotation when walking?
    - For total-contact socket (suction):
        - is the valve located to facilitate pullout of the sock and the manual release of pressure?

– when the valve is removed, does tissue protrude into the valve hole with no gapping?
– is suction maintained while walking?

8. Gait and alignment – are there any of the following deviations?
    - Abducted gait
    - Circumduction
    - Lateral trunk shift
    - Medial whip
    - Lateral whip
    - Uneven heel rise
    - Terminal swing impact
    - Foot slap
    - Uneven length of steps
    - Vaulting.

Check in sitting

1. Does the socket and limb remain in good alignment?
2. Can the patient remain seated without a burning sensation in hamstring area?
3. If total-contact socket – can the patient rise to a standing position without objectionable air noise from the socket?

Appendix 2.6 User groups information

The Limbless Association:

http://www.limbless-association.org/
The UK Limb Loss Information Centre:
http://limblossinformationcentre.com/

Limbcare:

http://www.limbcare.org/

All websites accessed 2 August 2011.

Case Study 2.1

The classic borderline patient

- James, transfemoral amputee.
- Age: 75 years.

Significant points from PMH

- Chronically infected (R) TKR with significant pain.
- Mobility limited to 25 m, using 1 stick, unable to do stairs.
- Short transfemoral residuum to ensure clearance of the infection.
- Several transient ischaemic attacks (TIAs) resulting in (R) sided weakness, hand tremor, mild cognitive impairment and expressive dysphasia.
- Small vessel disease observed on head CT scan.

Significant points from assessment following amputation

- Needing assistance of 1 for bed mobility, transfers, ADLs and sit to stand.
- 10° flexion contracture of the right hip.
- Weakness of residuum in all major muscle groups, MRC 4.
- MRC 4+ in the muscle groups around the (L) hip and (L) knee flexors.
- Poor dexterity of (R) hand, with limited function regards dressing, e.g. buttons and zips.

Identified goals and treatment plan

James did not meet the borderline criteria, but had potential for rehabilitation and improvement, was motivated and understood the implications of the goals that were set to assess his suitability for prosthetic rehabilitation.

Goals set to enable prosthetic rehabilitation

1. To achieve independence in bed mobility, transfers, sit to stand.
2. Trial with Femurett and achievement of independent mobility within the parallel bars

Week.1, daily treatment

- General PIRPAG and strengthening exercises concentrating on right hip extension.
- Graded transfer practice:
  - Sliding board and wheelchair, with side removed
  - Progressed to wheelchair side removed
  - Progressed to standing pivot transfer, requiring good push up from sides of wheelchair or plinth and strong quadriceps to enable clearance of side of

wheelchair.

- Graded sit to stand practice:
  - Raised plinth with a second plinth in front for support
  - Progressed to decreased height of plinth to progress ability
  - Progressed to pushing up from plinth, without using second plinth for support
  - Progressed to sit to stand from wheelchair within parallel bars, pushing up from wheelchair.

Week. 2, daily treatment

- Goal 1 had been achieved.
- Continued with treatment approach from first week, with the addition of mobility using Femurett within parallel bars.
- Preparation for mobility:
  - Weight transference exercises, e.g. stepping up onto block with (L) leg
  - Use of mirror to facilitate symmetry and good posture
  - Practice of hip hitching in stance.
- Mobility within parallel bars:
  - Starting with (L) leg leading
  - Verbal cues for short prosthetic stride and step through with (L) leg
  - Manual facilitation to encourage extension and control of the Femurett
  - Close supervision until patient was able to control Femurett independently.

Week 3

Patient had achieved the goals and met the criteria for prosthetic rehabilitation.

Outcome

- James achieved independence in donning his prosthesis with the aid of velcro fastenings and some assistance from his wife.
- He progressed to mobilising short distances using a rollator frame indoors.
- His rehabilitation took a further 6 weeks.

This case study highlights the importance of having identified criteria to work towards and how these may be used to inform goal setting.

Case Study 2.2

The complex multiple limb amputee

- Fiona.
- Age: 25 years.
- Prior to illness Fiona had been a very active person and presented as being very motivated.

HPC

- An acute onset of meningococcal septicaemia, resulted in 4 limb compartment syndromes.
- These had to be treated surgically by fasciotomies to all 4 limbs.
- The fasciotomies were not successful and Fiona underwent bilateral transtibial amputations, amputations of the (R) MCPJ index through to little fingers and (L) DIPJ index through to ring finger.
- Both thumbs were left intact.

Identified problems from assessment

- Unhealed areas on (R) upper limb with new grafted skin on all limbs, fragile and vulnerable to breakdown.
- 45° flexion deformity of (R) elbow and impaired (R) wrist extension impacting on ADLs, e.g. transfers, sit to stand and use of walking aids.
- Oedematous, scarred transtibial residuums.
- Global muscle atrophy and weakness of upper and lower limb muscle groups.
- Loss of independence with ADLs, due to partial hand amputations.
- Loss of mobility and participation in previous sporting and leisure interests.

Early rehabilitation goals and treatment options

- Promotion of healing:
  - Close liaison with other members of the MDT was vital for this goal.
  - Working with dieticians, nursing staff and specialists from plastics dressing clinic provided a framework within which physical rehabilitation could occur without putting the fragile skin at risk of damage.
- Treatments included:
  - Use of pressure garments, moisturising regimen
  - High-calorie diet with supplements
  - Exercise programme to maintain range of movement and improve circulation and promote healing.
- Manage and reduce residuum oedema:

- Fiona was unable to use early walking aids as a bilateral amputee
- Use of compression therapy, exercises, stump boards to control oedema.

- Increase power and range of movement in upper and lower limbs and preparation for mobility.
- Initially, Fiona quickly fatigued and treatment concentrated on achieving functional tasks, e.g. forward and backward transfers on and off all surfaces, bed mobility and learning how to manage her own personal care.
- As her exercise tolerance progressed she was able to engage in a daily exercise programme which consisted of:
  - Use of PIRPAG exercises for lower limbs and passive stretches to elbow and wrist
  - PNF techniques, e.g. double arm patterns for upper limbs and trunk
  - Core stability programme. This was progressed from exercises on a plinth to use of a gym ball, with Fiona sitting and then lying prone over the ball
  - Graduated resisted exercises with Thera-Band, weights, use of resistive equipment
  - Fiona was unable to use early walking aids, to enable early mobility
  - Exercises in 4 point, progressing to 2 point kneeling, to prepare for standing. These exercises were given to challenge balance and increase exercise tolerance with a progression to the upright position
  - Progression to 'Walking on knees' on mats, beside plinth, progressing to moving around a gym ball.

These treatments and the progressions enabled Fiona to prepare for and be successful with her prosthetic rehabilitation when her residuums were ready for prosthetic fitting.

Case Study 2.3

The pain patient

- Susan, transtibial amputation.
- Age: 49 years.

HPC

- Susan fractured her (R) ankle which was internally fixated and following problems this was subsequently fused.
- Susan is experiencing poor mobility and high levels of pain.
- It was agreed to carry out an elective transtibial amputation.
- The amputation went well and following successful rehabilitation using a patella tendon-bearing prosthesis Susan returned to work in a special needs school.
- I year later she began experiencing pain in the residuum, which led to her having reduced

mobility levels and being unable to work.

Management of and investigations for residual limb pain

To identify the causes of her symptoms the team used the pain pathway to help guide interventions (Figure A2.3.1)

RLP or PLP = RLP
↓
External or Internal causes
↓
External: New prosthesis manufactured to ensure correct socket fit
Internal: No infection, good vascularity
↓
Tender to local palpation – yes
↓
Likely cause due to location is neuroma
↓
Differential diagnosis made through U/S scan and then injection into neuroma which relieved Susan completely of her pain for 6 weeks
↓
Final intervention was the surgical removal of the neuroma.

Physiotherapy interventions during this process

- Desensitisation techniques to reduce sensitivity.
- Oedema control techniques to ensure stable volume and therefore correct socket fit, including the use of a compression sock and instructions to reduce hopping with crutches.
- To achieve the successful outcome a full MDT assessment of her problems was needed, which enabled Susan to return to her previous successful level of mobility and function.

Chapter 2 Amputees: multiple choice questions

1. What is the most common cause of amputation in the UK?
    a). Trauma
    b). Dysvascular
    c). Type 2 diabetes
    d). Infection

2. Which of the following amputations is recommended for a non limb wearer with no possibility of transfers?
   a). Transtibial
   b). Knee disarticulation
   c). Transfemoral
   d). Hip disarticulation
3. Which investigation does not determine amputation level?
   a). Angiography
   b). Joint ROM
   c). Neurological assessment
   d). Muscle strength
4. Which level is the stump board a useful part of oedema control?
   a). Transtibial
   b). Transfemoral
   c). Transtibial and knee disarticulation
   d). Transfemoral and knee disarticulation
5. When should the amputee be encouraged to start desensitisation of their residuum?
   a). From day 1
   b). When stitches are removed
   c). When residuum is healed
   d). When they are ready
6. Which of the following would be an extreme caution to use of the PPAM Aid?
   a). Unhealed residuum
   b). Phantom pain
   c). An ischaemic wound
   d). Ulcer on remaining limb
7. Which of the following is a pathway for phantom pain management?
   a). Preoperative epidural; postoperative medication; postoperative desensitisation; night sock
   b). Postoperative medication; postoperative desensitisation; night sock; exercise and compression therapy
   c). Postoperative medication; postoperative desensitisation; exercise and compression therapy; psychological support
   d). All of the above
8. Which of the following would not influence referral for prosthetic rehabilitation?
   a). Ability to process information
   b). Length of residuum
   c). Independence with wheelchair
   d). Pain
9. What pressure should the PPAM Aid be inflated to?
   a). 30 mmHg
   b). 40 mmHg

c). 50 mmHg
d). 60 mmHg

10. What is the most common contracture in a transfemoral amputee?
a). Knee flexion of remaining limb
b). Hip flexion of remaining limb
c). Hip flexion of residuum
d). Hip abduction of residuum

11. Which of the following is not a method of prevention of contracture for an amputee?
a). Joint stretches
b). Wheelchair stump board
c). Prone lying
d). Pillow under knee in bed

12. What is the most common amputee gait deviation?
a). Decreased stride length of remaining limb
b). Decreased stride length of prosthetic side
c). Abducted gait
d). Vaulting of remaining limb

13. What would be the most significant influence on the balance of a bilateral amputee?
a). Height
b). Equal length of residuums
c). Muscle strength
d). Core stability

14. At which level is a hip flexion contracture the most problematic?
a). Transtibial
b). Knee disarticulation
c). Transfemoral
d). Bilateral transtibial

15. Which of the following levels of amputees is the prescription of a prosthesis for transfers only useful?
a). Single transtibial amputee
b). Single transfemoral
c). Single transtibial and single transfemoral
d). Single transtibial and bilateral transtibial

16. Which of the following would not be a contraindication to prosthetic use?
a). Infected exudate
b). Dry scab with erythema
c). Dehiscing wound
d). Cold, ischaemic residuum

17. Which of the following amputations is able to weight bear on the end of their residuum?
a). Transtibial
b). Transfemoral
c). Knee disarticulation

d). Hip disarticulation

18. When assessing a diabetic amputee what is the most common sign and symptom that impacts on prosthetic rehabilitation?
    a). Muscle weakness
    b). Poor proprioception
    c). Distal neuropathy of remaining foot and residuum
    d). Pain
19. What advice would you give an elderly primary amputee if they needed to ascend and descend stairs pre-prosthetically?
    a). To hop using banisters
    b). To hop using crutches
    c). Backward chaining
    d). Not to do them
20. For the diabetic amputee which MDT member is key to their prosthetic mobility?
    a). Medical social worker
    b). Psychologist
    c). Orthotist
    d). Dietician

Amputee rehabilitation multiple choice answers

1. b) NASDAB statistics 2007
2. b) This provides improved sitting balance and a weight-bearing residuum if needed to aid transfers. A transtibial residuum can become contracted and have potential for breakdown or injury
3. d) This can be improved. Angiography will determine potential for healing; FFD at hip or knee can determine level – FFD of knee is a contraindication to a transtibial amputation; increase tone in a stroke patient affecting potential amputation side would prohibit a transtibial amputation and decreased or absent sensation in the diabetic patient can influence level
4. c) If the knee disarticulation residuum protrudes over the end of the cushion and is unsupported, oedema can accumulate and cause discomfort
5. a) Early handling will start process of desensitisation and is not detrimental to the residuum
6. c) SPARG guidelines
7. d)
8. b)
9. b) (Dawson et al 2007)
10. c)
11. d)
12. a)
13. a) Decreasing amputee height lowers the centre of mass (COM) improving balance (Gailey & Clark 2004)

14. b) The effect of hip flexion deformity on prosthetic alignment is exacerbated with this long lever and can cause great problems with gait re-education
15. d)
16. d) Infection can be treated and managed during rehabilitation; dehiscing wound can be managed under the 'Manchester protocol' (Van Ross et al 2009). A cold ischaemic residuum will be painful, may break down and need revision surgery
17. c)
18. c) This will impact on proprioception, balance and the overall management of the amputee
19. c) Safest method
20. c) Orthotic management of the remaining foot is key to safe and successful mobilisation

Chapter 3

Aquatic Physiotherapy

Treatment methods

- The physical properties of water covered in the assessment chapter facilitate the application of treatment techniques that can be used to provide therapeutic benefits for patients managed in a pool. Methods of utilising these physical properties of water are as follows.

Uses of buoyancy

- To progressively strengthen concentric muscle actions (assisted – neutral – resisted)
- To resist eccentric muscle actions
- To resist isometric muscle actions
- To assist joint movement
- To assist prolonged muscle stretches
- To provide weight relief
- To assist relaxation
- To assist in the application of the metacentric effect.

Uses of turbulence

- To assist movement.
- To resist isometric muscle action.
- To resist isotonic muscle action.
- To maintain balance.
- To displace balance.
- To restore balance.
- To assist walking.
- To resist walking.

The grading of muscle actions in water

- Muscle strength is graded on land according to the Oxford or Muscle Test Rating scales.

In water these scales are modified so that muscle strength can be finely graded utilising hydrodynamic principles. As on land this scale is subjective, especially when there is no 'normal' limb to compare against.

Muscle strength grading in water

Grade 0 No contraction
Grade 1 Assisted by buoyancy
Grade 2– Buoyancy counterbalanced
Grade 2 Buoyancy counterbalanced with speed
Grade 2+ Against buoyancy
Grade 3 Against buoyancy with small float or with speed
Grade 3+ Against buoyancy with larger float
Grade 4 Against buoyancy unstreamlined
Grade 4+ Against buoyancy with large float with speed
Grade 5 Against buoyancy unstreamlined with maximum speed or with largest float able to be moved

Muscle actions during immersion

Concentric

When considering the effect of buoyancy (alone), on movements at slow speed, the effect is as follows:

Buoyancy assisted Moving a limb or body part towards the water surface
Buoyancy counterbalanced Any movement of a limb or body parallel to the water surface
Buoyancy resisted Movement of a limb or body part downwards against the upward thrust. This resistance can be increased by the use of additional flotation aids, or by lengthening the lever arm.

Eccentric

- These contractions can only be achieved by moving a limb towards the surface at a slower rate than the upthrust effect is trying to produce. Extra flotation aids will be required for effective muscle work due to the close relative density of water and the limb.

Isometric

This type of muscle action can be achieved by:

- Buoyancy Maintaining the position of a limb or body part against the upthrust forces.
- Metacentre Holding an adopted position with altered body shape against the rotational forces caused by an imbalance between the forces of buoyancy and gravity.
- Turbulence Holding the position of a limb or body part against the drag created by an area of turbulence (low pressure water) created by the physiotherapist.
- Drag effect Holding a posture against the drag effect created when the therapist moves a patient through the water.

  The latter two effects can equally be used to promote concentric dynamic muscle action.

Muscle strengthening: using buoyancy, turbulence and the metacentric effect

Buoyancy

Resisted concentric

- The body part is moved away from the water surface – limbs will need a flotation aid due to their higher relative density, e.g. to strengthen the left shoulder adductors a float is held in the left hand. The patient stands, leaning over to their left side with the shoulder immersed. The left arm is pulled down from the surface through the water to come to the patient's side.
- These techniques are generally written as 'buoyancy resisted'.

Resisted eccentric

- The patient has a hand float attached around an ankle and the ankle is allowed to be taken towards the surface, passively flexing the knee. The patient controls the rate of movement of the ankle, so that it rises to the surface at a slower rate than the float is trying to take it. For example, an eccentric quadriceps exercise requires the patient to stand at the pool side with a float round their ankle. They let the knee flex slowly so that the float gradually moves towards the surface.
- These techniques are generally written as 'buoyancy resisted'.

Assisted

- The body part is moved towards the water surface using the assistance from a float (usually a very small one). The speed must be slightly greater than that created by

upthrust alone.

- These techniques are generally written as 'buoyancy assisted'.

Counterbalanced

- The body part is moved parallel to the water surface.
- These techniques are generally written as 'buoyancy counterbalanced'.

Utilising turbulence

Therapist created

- The therapist creates an area of fast-moving water to create drag on a body part. The patient resists movement towards this area of low pressure, e.g. to create resistance for the biceps. The patients arm is supported on a float at water surface. The therapist then creates turbulence over the posterior forearm and outwards.
- These techniques are generally written as 'turbulence resisted'.

Patient created

- The patient moves a body part through the water, thus creating an area of low pressure behind the moving part, e.g. to create a strengthening exercise for the shoulder flexors and extensors the patient moves their arm briskly backwards and forwards through the water.
- These techniques are generally written as 'speed resisted'.

Via the 'drag' effect

- The patient is moved through the water while they hold a position against the drag of the water. For example, to strengthen the trunk side flexors the patient is supported supine on floats. The therapist holds the patient either at the ankles or the shoulders and swings them sideways through the water while the patient tries to prevent side flexion.
- These techniques are generally written as 'drag resisted'.

Utilising the metacentric effect

- The patient holds a position against the turning forces created, e.g. patient in supine lying, works against the following movements to prevent the tendency for the body to rotate along its longitudinal axis:
  - Turning the head
  - Taking an arm or leg out to the side

- Lifting an arm out of the water.
- Patient in standing or in the 'box position' (squatting in the water as if sitting on a chair), supine lying, works against the following movements to prevent the tendency for the body to rotate around its transverse axis:
  - Taking the head forward, backward, or to the side
  - Taking the arms forward or backward
- These techniques are generally written as 'metacentre resisted'.

Physiological considerations

- Comparing oxygen consumption and heart rate responses during exercises performed on land and in the water, both heart rate and oxygen uptake are greater during exercises in water.
- Evidence indicates that viscosity and turbulence provide a greater load during exercise than the resistance of gravity during land exercises.
- Oxygen consumption increases by about ten times over resting values in the water for male subjects performing leg exercises and about seven times for women.
- Arm exercises performed in water require less energy than leg exercises in water.
- However arm exercises require significantly more oxygen when performed in water than the same exercises performed on land (Johnson et al 1977).

Improving range of movement (ROM)

Utilising buoyancy

Buoyancy assisted

- The body part is moved towards the water surface, assisted by a float. This can be done as a contract/relax technique or as a prolonged stretch (Figures 3.1-3.17).
- These techniques are generally written as 'buoyancy assisted'.
- Therapist created turbulence can be added to assist the effect.

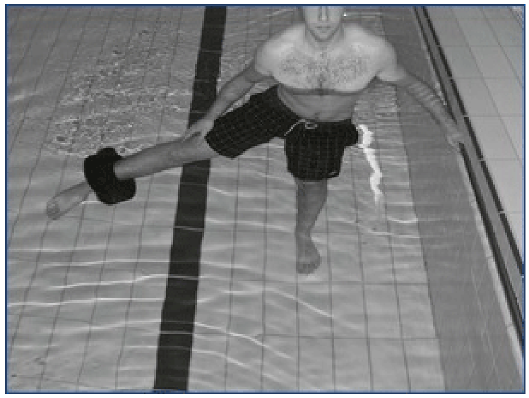


Figure 3.1 Stretch for hip abductors (right illustrated).

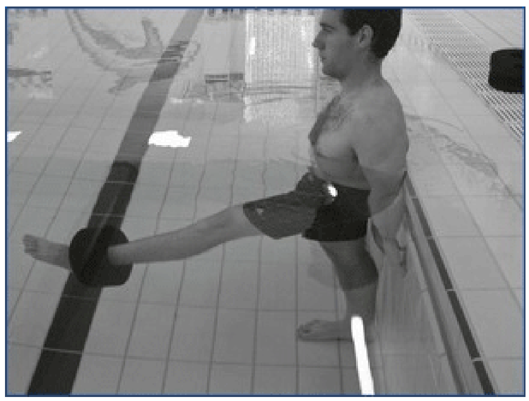


Figure 3.2 Stretch for hamstrings (left illustrated).

Figure 3.3 Stretch for hip flexors (left illustrated).

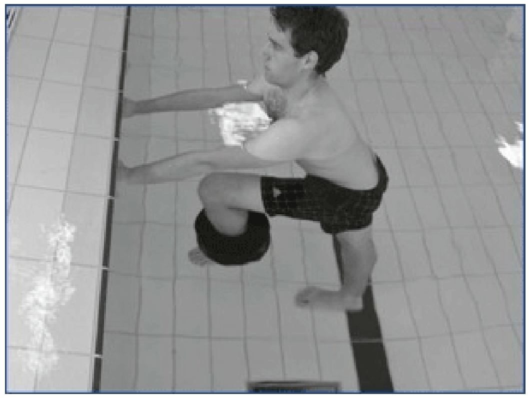


Figure 3.4 Stretch for hip extensors (left illustrated).

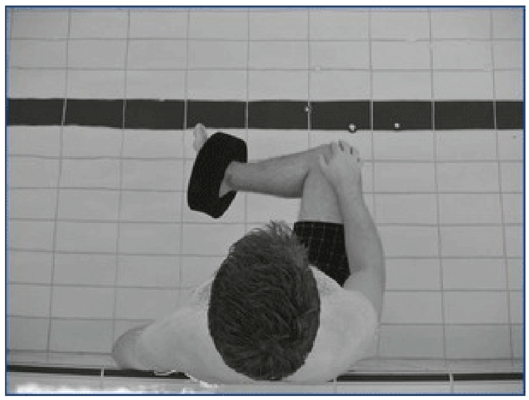


Figure 3.5 Stretch for hip rotators (right lateral rotators illustrated).

Figure 3.6 Stretch for hip rotators (right medial rotators illustrated).

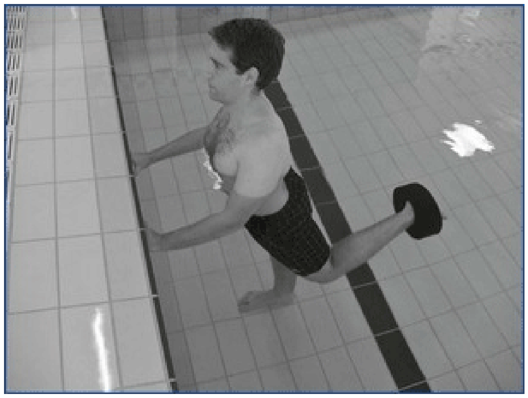


Figure 3.7 Stretch for knee extensors (left illustrated).

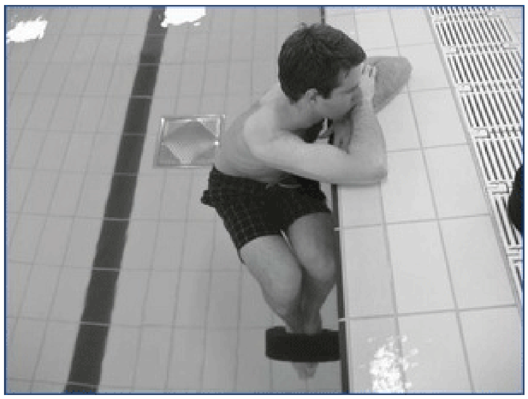


Figure 3.8 Stretch for hip extensors and spinal rotators.

Figure 3.9 Stretch for knee flexors (right illustrated).

Figure 3.10 Stretch for hip flexors and quadriceps (right illustrated).

Figure 3.11 Stretch for shoulder adductors (right illustrated).

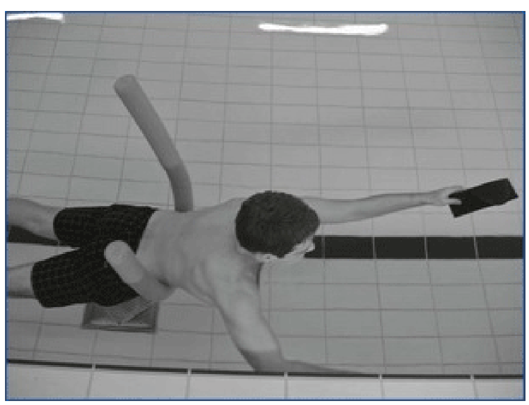


Figure 3.12 Stretch for shoulder to increase flexion (left illustrated).

Figure 3.13 Stretch for abdominals.

Figure 3.14 Trunk side flexors (left illustrated).

Figure 3.15 Pectorals and abdominals.

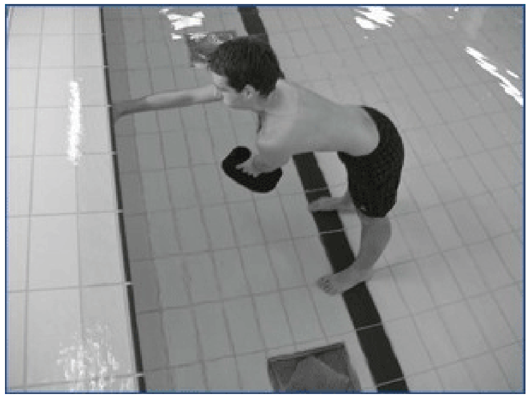


Figure 3.16 Trunk rotators (left illustrated).

Figure 3.17 Combined hip and trunk rotators.

The lower limb stretches

- Keep trunk upright allow float to take leg up towards surface of pool (Figure 3.1).
- Trunk braced against poolside, patient instructed to hold a lordosis, allow float to take leg up towards surface of the pool (Figure 3.2).
- Patient holding onto side of pool (elbows flexed to help keep body upright). Patient flexes left knee and hip to eliminate lumbar hyperextension (Figure 3.3). Allow float to take leg towards surface of pool, patient instructed to keep knee in extension.
- Patient holding side of pool with elbows extended. With left hip and knee flexed, allow float to bring the flexed leg towards pool surface (Figure 3.4).
- Patient with trunk braced against pool side, right hip flexed to 90°, right hand to fix knee to enable rotation around axis of femur to occur. Allow float to bring the foot up (Figure 3.5).
- As per stretch for lateral rotators, but with opposite rotation of femur (Figure 3.6).
- Patient holds side of pool to keep trunk upright and thigh in neutral position. Allow float to bring foot up towards pool surface (Figure 3.7).
- Patient facing pool side with both forearms on rail. Tread on inside of inner surface of

ring. Twist knees to R and flex both up the wall to the R so that L thigh is against wall. Both feet and float remain under the knees (Figure 3.8).

- Patient in standing or sitting on stool, flex hip to 90°. Patient to fix thigh position and allow float to bring foot up to surface of pool (Figure 3.9).
- Patient with trunk horizontal to water surface, left hip in 90° flexion, allow float to take foot up to surface of pool (Figure 3.10).

The upper limb stretches

- Patient supported by floats in right side lying, facing side of pool. Keeping elbow extended allow wrist float to bring the arm through abduction to surface of pool (Figure 3.11).
- Patient with trunk parallel to pool surface with waist float. Keep elbow in extension allow float to bring hand to surface of pool (Figure 3.12).

Trunk stretches

- Patient prone, keeping knees extended allow float to bring legs to surface of pool, producing spine extension (Figure 3.13).
- Patient to grasp side of pool, keeping shoulders level and thighs against pool side, allow float to bring the legs up towards pool surface (Figure 3.14).
- Patient holding pool side with feet fixed on pool floor. Allow float under scapulae to bring trunk up to pool surface (Figure 3.15).
- Patient grasps pool side with right arm in extension. Patient reaches under the trunk with left arm and allows float to take the hand up to pool surface (Figure 3.16).
- Patient with float under hips and float around ankles allowing feet to float to surface of pool, keeping thighs in the water (Figure 3.17).
- The stretches can also be carried out as slow prolonged stretches, using flotation and the same starting position as described in Figures 3.1-3.17. With this type of stretch the end position with buoyancy providing the stretch should be maintained for 30–60 seconds.

Buoyancy counterbalanced: mobilising work

- The body part is moved parallel to the water surface, this is done slowly in order to avoid the build up of turbulent (low pressure) water behind the moving part.
- These techniques are generally written as 'buoyancy counterbalanced'.

Stretches using drag

- Some muscle groups can also be stretched using the principles of drag. In most instances the patient needs to be supported on floats and the body moved through the water in a direction which provides drag on the muscle group to be stretched, e.g. the patient lies supine supported by floats, while the therapist grasps either the shoulders or lower legs

and moves the patient in an arc to the right, which will stretch the right side flexors.

- Stretch can be increased by increasing the speed of movement and/or by increasing the length of the moving lever.
- For these stretches to be effective the patient must be able to relax whilst lying on floats.

Specific stretches using drag

Muscle group	**Starting position**
Trunk side flexors	Supine lie
Trunk rotators	Supine lie, therapist adds rotation as the body moves through an arc
Trunk flexors/extensors	Side lie
Hip adductors	Supine lie
Shoulder adductors	Supine lie
Shoulder extensors	Prone or side lie
Pectorals	Standing – walking forwards holding bats in both hands
	– walking in a circle holding a bat in the hand of the arm to be stretched
Elbow flexors	Standing – walking forwards holding bats in both hands
	– walking in a circle holding a bat in the hand of the arm to be stretched

Therapeutic methods developed to utilise the properties of water

Other treatment techniques that rely on the use of the physical properties of water include the Bad Ragaz Ring Method, and the Halliwick Concept.

The Bad Ragaz Ring Method (BRRM)

- Bad Ragaz, spa town, Switzerland (BR).
- Ring Method (rings = floats).

Bad Ragaz, background

- In the 1930s, land exercises were applied in water without attention to the properties of water, Dr Knupfer from Germany developed exercises where the physiotherapist acts as a fixed point for movement and the patient is supported in supine lying with pelvic and neck floats.
- During the 1940s and 1950s the polio epidemic in the USA led to the development of the

proprioceptive neuromuscular facilitation (PNF) techniques by Knott and Voss in the USA during the 1960s (Voss et al 1985).

- Bad Ragaz techniques were developed through a combination of the earlier German techniques and the PNF techniques in Bad Ragaz, Switzerland, which gives the method its name.
- The most significant developments of the Bad Ragaz Ring Method (BRRM) took place between the early 1960s and 1990. Initially these techniques were developed by Dr Zinn and Nele Ipsen and later by Bridget Davies and Beatrice Egger who published articles outlining the therapeutic processes and the benefits to be gained from this form of therapy (Davies 1967, Zinn 1975, Egger and Zinn 1990).

Features of BRRM

- The method utilises the properties of water of turbulence and streamlining, with buoyancy being used as a support and not as a means of resistance during exercise.
- Turbulence provides resistance due partly to negative pressure behind the moving body i.e. 'negative drag,' resulting from the formation of eddy currents, which impede forward movement.
- Turbulent drag is directly proportional to the speed of movement through water, therefore the faster the patient moves, the greater the resistance. This is controlled by the patient and therefore the method is 'self regulating'.
- It restores anatomical, biomechanical, physiological movements of joints and muscles in functional patterns.
- The therapist is one to one with a patient in the water.

PNF and BRRM

- There are some similarities and some important differences between PNF techniques and BRRM.
- The similarities to PNF are:
  - Functional patterns of movement
  - Commands are short with as few words being used as possible
  - Weak muscles are recruited in patterns by overflow from stronger muscles
  - Patterns may be unilateral or bilateral
  - Maximal resistance is used.
  - Sensory stimulation is maximised.
  - Traction and approximation may be applied, but due to the instability of the body in the water this is more difficult than on land.
- The differences to PNF are:
  - Resistance is provided principally by the movement of the body through the water causing turbulence together with the directing manual force applied by the physiotherapist.

– Stretch stimulus is not generally possible for facilitation of a muscle contraction because the patient is free floating.
– In BRRM the patient controls the resistance applied by controlling the speed of movement during isotonic patterns. In PNF the therapist applies the resistance according to the patient's ability.
– Generally PNF is open chain and BRRM is closed chain.
– In BRRM the therapist provides the fixed point during isotonic patterns. In PNF the therapist moves with the working part of the patient's body.

Principles of the technique

- The patient's starting position may be supine lying, side lying or prone lying and is varied according to the aim of the exercise and by the position of the limbs.
- Usually the patient floats with a neck collar or floatation helmet and a large body ring or float around the pelvis.
- Smaller floats are attached to the legs and arms as necessary.
- The density of all the floats is varied according to the size and weight of the patient.
- The floats provide support and correct positioning of the patient.
- In order to have control of the patient and to be able to grade the strength of a movement and the resistance given, the physiotherapist must be stable in the water with the patient on a one-to-one basis.
- The therapist must be in walk or stride standing with feet at least shoulder width apart and hips and knees slightly flexed.
- The therapist transfers body weight from one foot to another according to the direction of movement and the specific exercise.
- The water level should be between the waist and axilla of the physiotherapist who may wear special non-slip shoes to provide more friction. The floor of the pool must be even, with non-slip tiles. This enables the physiotherapist to maintain control of the movements.
- The position of physiotherapist hands on the patient influences the stability and direction of movement of the patient and the amount of isotonic or isometric work required.
- If the patient is severely disabled, anxious or afraid of water or has extensive muscle weakness proximal supports are used to increase patient confidence and therapist control.
- Distal supports at the end of a limb or trunk allow for greater range of joint movement and stronger muscle action due to lengthening of the lever.

Aims of treatment with BRRM

- Increase joint range of movement.
- Increase mobility of neural and myofascial tissues.
- Improve muscle function.

- Relieve pain.
- Improve stability of trunk and proximal stability of the limbs.
- Preparation of lower limbs for weight bearing.
- Restoration of normal patterns of movement including co-ordination in upper and lower limbs.
- Restoration of patient's confidence.

Indications for BRRM

- Orthopaedic and rheumatology conditions, e.g. rheumatoid arthritis, spondylosis, osteoarthritis, including pre- and postsurgery, fibromyalgia, ankylosing spondylitis.
- Post fracture, e.g. spine, pelvis and lower limb.
- Soft tissue injuries.
- Thoracic or breast surgery.
- Neurological conditions, e.g. cerebrovascular accident, spinal injury, Parkinson's disease, head injury. Patients exhibiting hypertonicity should be treated by experienced practitioners in order to avoid exacerbating any increase in tone. Rapid and fatiguing activities should be avoided for the same reason.
- Problems associated with learning disabilities.
- Children, particularly those with juvenile idiopathic arthritis.

Contraindications and precautions

- Patients are screened for all contraindications to aquatic physiotherapy.
- Programmes must be planned to avoid fatigue of patients (the freedom of the water may encourage too much activity).
- Patients receive a large amount of vestibular stimulation during treatment (avoid giddiness).
- Caution during treatment for those patients with acute conditions of spine or extremities, due to the possibility of over stretching painful, swollen or hypermobile joints.
- Patients with neurological conditions where active or resisted exercises increase spasticity in the trunk or limbs, or in the presence of hypertonicity.

Application of BRRM techniques

- Teach or show the patient the movement pattern passively on the affected limb to ensure correct movement components or teach on the unaffected stronger limb first.
- Bilateral patterns may be used initially if the patient's balance in water is poor.
- Where there is limited joint range of motion, muscle weakness and pain.
  - Limbs, begin with trunk patterns. This is on the basis that the trunk muscles are strong and this utilises the use of overflow into weaker muscle groups or induces movement in areas that may be painful.

- Start with limbs patterns, in order to treat trunk problems, e.g. low back pain.
- Muscle weakness (lower motor neuron pathology), use overflow from stronger muscles.
- Pain, start with isometric patterns. Control range to pain free movement only.
- PNF techniques such as slow reversals (reciprocal patterns), repeated contractions and rhythmical stabilisations may be applied.
- Initially BRRM techniques may form only 5 to 10 minutes of the aquatic physiotherapy session, progressing to 10 to 20 minutes of the total. This will be dependent on the nature of the patient's condition, age and ability to learn and perform the patterns.

Patterns of movement

- The patterns of movement can be divided into lower limb, upper limb and trunk patterns.
- The limb patterns can be unilateral or bilateral.
- They can also be classified as isometric and isotonic in relation to the type of muscle work performed by the target muscle group.
- In isometric movements the patient holds the limbs or trunk in a set pattern while being pushed through the water by the physiotherapist.
- In isotonic movements the patient moves towards or away from the physiotherapist who acts as a fixed point.

Examples of patterns: isotonic muscle work

- Bilateral hip abduction and adduction patterns:
  - The patient lies supine with neck and pelvic floats.
  - The physiotherapist stands at the patient's feet and places the hands on the lateral side of the feet, particularly the heels.
  - The patient abducts both legs and moves through the water towards the physiotherapist, who stands steady and provides the force, against which the patient pushes into abduction. The therapist guides the movement.
  - The patient then relaxes, the physiotherapist steps backwards and passively adducts the patient's legs and the movement is repeated.
  - Hip extension and medial rotation movements can be added to the abduction movement.
  - The pattern is reversed for adduction, with the physiotherapist's hands being placed medially over the patient's heels.
  - The patient adducts the legs and moves away from the physiotherapist, who has to step forward and move the patient's legs passively into abduction. The movement is then repeated.
  - Hip flexion and lateral rotation movements can be added to the adduction pattern.
  - The patterns can be repeated one after the other without a break (PNF slow reversals).

– The physiotherapist remains in one place and transfers body weight from back foot to front foot (abduction pattern) and from front foot to back foot (adduction pattern).

Examples of patterns: isometric muscle work

- Arm abduction patterns
    - Bilateral pattern
    - – The patient abducts both arms in a pain free range and maintains this position as the physiotherapist holds the feet and at the same time pushes the patient through the water, head first.
    - Unilateral pattern
    - – The patient is instructed to hold one arm in abduction and the physiotherapist's hands are placed on the trunk. The patient is moved by the physiotherapist walking in a clockwise direction so that the right arm is working isometrically against the turbulence of the water (Voss et al 1985).

Adaptations of patterns

- Patterns may be adapted by the physiotherapist using therapeutic principles, e.g. one limb can provide stability working isometrically whilst the other limb works isotonically. For example,extension, abduction and medial rotation of one leg working isometrically and flexion, adduction and lateral rotation of the opposite leg working isotonically or upper and lower limbs working simultaneously, one side isometrically and the opposite side isotonically.

Adaptation of patterns to patients

- As a patient improves resistance can be increased by:
    - – Increasing the speed of the body moving through the water
    - – Making the body less streamlined e.g. add floats or change the shape of the body
    - – Moving the physiotherapist's hand position distally i.e. increasing the lever arm
    - – Using larger and quicker movements
    - – Using quick reversal and reciprocal patterns, i.e. working into and out of the negative drag effect and cumulative increased turbulent drag
    - – Changing direction of movement, with the point of fixation being moved in the direction of the movement
    - – Increasing the repetitions.
- If the patient becomes weaker demand for muscle work can be decreased by:
    - – Decreasing the speed of the body through the water - less turbulence and therefore less resistance
    - – Making the body more streamlined
    - – Moving the manual hold proximally thereby decreasing the leverage

– Movement of the point of fixation in the opposite direction to the movement
– Using slower smaller range movements
– Working in one direction only – so that the there is a work/rest ratio of activity for the patient.

The Halliwick concept

Halliwick background

- The Halliwick concept is an approach to teaching people water activities, with particular focus on those with special needs, to enable them to become safe and independent in water and in some cases swim independently.
- Water happiness is the key to the success of the concept.
- The Halliwick concept was developed by James McMillan in the 1940s at the Halliwick School for Girls with Disabilities in London.
- The concept is now managed by the Halliwick Association of Swimming Therapy (Halliwick AST) (http://www.halliwick.org.uk/).
- The concept has developed internationally and in 1994 the International Halliwick Association (IHA) was formed.
- There is strong emphasis on ability, rather than disability and on the application of the effects of water on the human body.
- The concept uses the term 'swimmer' for the person who is learning and 'instructor' for the helper or teacher.
- There is a one to one ratio of instructor to swimmer until the swimmer has reached a stage of proficiency, e.g. safe independence in water.
- No flotation aids are used, so that the swimmer learns to use the support of the water and the instructor, rather than floats, to facilitate their activities.

Ten Point Programme (TPP)

The concept is based on the application of the TPP.

Mental adjustment

- This is a continuous process from the start of a programme.
- The Swimmer learns to adjust to the effects of turbulence and buoyancy, so that they gain good body control and become safe and water confident.
- The Instructor teaches breathing control, which is essential for safety and progression and this is the first skill that is taught:
  – The swimmer is encouraged to breathe out every time the mouth comes into contact with the water.
  – First, with the face out of the water, the swimmer blows on to the surface of the

water or on a floating object.
  – This is repeated with the mouth at water level.
  – Then with the mouth under the water (oral breathing, blowing bubbles).
  – Followed by the nose submerged (nasal breathing blow bubbles from the nose or hum).
  – Progression is made by maintaining rhythmical breathing and controlled bubble blowing when the face is in the water, while performing different activities in different positions.
  – Breath holding and over ventilation is avoided at all times.
- Different activities and movements are introduced in order that the swimmer experiences the various ways in which the water affects balance and control of the body. Good mental adjustment results in a happy, relaxed swimmer.

Disengagement

- This is a continuous process.
- A swimmer is encouraged to reduce the reliance on the instructor and become independent in the water.
- At the start, the instructor judges and applies the amount of manual support required for the safety and confidence of the swimmer and this is gradually reduced as the swimmer progresses.
- The process involves turning from facing the instructor, to having the back to the instructor thereby reducing eye to eye contact.
- Instructors can be changed so that the swimmer is moving from parents to others.
- Further progression can be gained by: moving away from the side of the pool, changing from feet on floor to lying back, reducing verbal instructions, independent entry to the pool, introducing basic swimming strokes, changing groups and further social integration.
- Disengagement is necessary as each new skill is learnt. The swimmer begins with full support and this is gradually reduced until, where possible, it is reduced altogether and the swimmer is independent of the instructor.

Transversal rotational control

- This involves movement in the sagittal plane around a transverse axis, e.g. regaining the upright position from the horizontal position and the horizontal position from the upright position. The most advanced form of this is somersaulting.
- Due to the long radius, movement in this plane is difficult to initiate, alter and to stop.
- Changing from supine to the upright position requires flexion of the cervical spine, flexion of the trunk, hips and knees and balance of the head over the body to regain and maintain the vertical position. Swimmers with hydrocephalus and spina bifida have particular difficulties achieving this.
- Changing from the upright to supine requires some extension of the cervical spine, trunk,

hips and knees.

Sagittal rotational control

- This involves movement in the transverse plane around a sagittal axis, i.e. any activity which involves trunk side flexion such as side stepping.
- It may be the upper trunk or the lower limbs moving side to side and can be performed in the upright or horizontal positions.
- The whole body may move, e.g. the instructor moves the swimmer side to side at the waist. These movements are helpful in gaining relaxation, which in turn promotes confidence and mental adjustment.
- Application to functional activities occurs when the swimmer is in a wheelchair for example, retrieving objects from the floor.
- The rotation is a useful activity for releasing tightness on one side of the trunk and also for actively working trunk side flexors.

Longitudinal rotational control

- This involves movement round a longitudinal axis, i.e. any activity that involves rolling over.
- It may occur in two positions, when the patient is standing movement can occur around a vertical axis and when they are lying a movement can occur around a horizontal axis.
- Due to the short radius it is easy to initiate and difficult to control.
- The swimmer may initiate this movement by turning the head or by positioning the arm or leg across the body in the direction of movement.
- As the body is asymmetrical rotation may occur naturally.
- Asymmetry may occur due to alteration of body density or shape, e.g. following stroke or head injury.
- Importantly the swimmer must learn to control this rotation in order to become confident balancing in the water when it becomes 'choppy' due to the turbulence created by other people moving around.
- The radius can be increased, e.g. by spreading the arms sideways, to increase the stability around the axis in early stages.
- As a progression the swimmer should be able to control the rotation with a short radius.
- This rotation works the rotator muscles of the trunk, upper and lower limbs and is useful for trunk mobilising with patients with Parkinson's disease.

Combined rotational control

- This is the ability to produce or control any combination of rotations executed in one movement.
- This is necessary for the patient to be able to achieve the upright position from the horizontal prone position and from an independent entry to a pool so that they can

achieve a safe breathing position.

- On reaching the side of the pool in a supine position the swimmer reaches over to grasp the pool rail, turns to the vertical and is safe.
- If a swimmer falls forward in trying to get the feet off the floor then turning the head to look at the Instructor facilitates this control and ensures safety.
- Mastery of this rotation means that the swimmer can control their position and is therefore safe in water.
- Inhibition of unwanted rotational movements may be necessary to remain in a safe breathing position.

Upthrust

- This involves developing the swimmer's awareness of the effects of buoyancy and in learning that the water always pushes upwards.
- It may be introduced by demonstrating that when a low density ball is pushed under the water and then released it bobs up to the surface.
- The swimmer can appreciate the force when attempting to crawl on the pool floor. A few people are natural sinkers and must learn to push up from the floor of the pool.
- Advanced level of breathing control is necessary, it is essential that bubbles can be seen leaving a swimmer's mouth and nose during submersion.
- As the swimmer progresses, particularly with breathing control, submersion activities facilitate an understanding of upthrust and assist the swimmer to overcome the fear of water.
- The activity is useful for swimmers requiring improved respiratory control.

Balance in stillness

- This involves teaching the swimmer to maintain a relaxed body position while floating e.g. lying on the back while the water is moving and tending to turn the body.
- By experimenting with different body shapes the swimmer learns to float in a position that is stable and is a safe breathing position.
- This requires the swimmer to make constant controlled adjustments to keep the body balanced.
- Everybody has a balanced position in water in which the body can float, but this is not necessarily horizontal.
- The swimmer may start to learn this by 'sitting in a chair' (chair position) and the Instructor creates turbulence at the front, sides, and back. Ideally the swimmer starts in still water and progresses to turbulent water.

Turbulent gliding

- This teaches the swimmer to control the body position in lying while being moved through the water by the instructor.

- The instructor creates turbulence under the swimmer's shoulders and the swimmer's body is pulled along by the turbulence as the instructor walks backwards.
- There is no touch contact between the swimmer and instructor.
- The swimmer is not involved in the creation of movement through the water, but must control any tendency to roll.
- This is likened to ducklings floating along in the turbulence created by the mother.

Simple progression, basic swimming stroke

- This is the beginning of the progression to moving independently through the water.
- The first simple propulsive movements made by the swimmer are usually elementary movements of the hands close to the body in supine at the centre of balance, sculling actions or side clapping movements. If the hands do not produce the propulsion then leg or shoulder movements may be used.
- When balance and co-ordination have developed this should enable the swimmer to combine both arm and leg movements.
- Further progression is to try swimming strokes, often modified arm backstroke.
- In this stroke both arms are taken low and wide over the water (if too high the body sinks) to enter at '10 to 2' in relation to the head at being at '12 o'clock'.
- The hands are then pulled slowly through the water to the side of the body.
- During the resultant gliding action arm movements are stopped.
- Leg action can be added if appropriate; however, only 73% of swimmers with physical disability can use only the arms.
- Bilateral movements avoid lateral instability and the supine position allows easy breathing.
- This stroke is useful for many swimmers, but any stroke that can be adapted to suit individual needs is suitable.
- The ten point programme takes the swimmer to a basic stroke only and is the starting point for other swimming strokes.
- The programme gives a logical order for teaching and all points must be mastered to produce a safe and independent swimmer

Summary of benefits of the use of the Halliwick concept

- The concept enables people with disabilities to acquire the skills of the ten point programme by working with one instructor at a time.
- Some swimmers go on to be entirely independent in the water; however, others need instructor support all of the time.
- In clubs the Halliwick philosophy is to encourage siblings who may be able bodied to join in the activities and for parents to act as instructors. This encourages family activity and social interaction.
- In addition to the benefits from the activities outlined the Halliwick concept swimmers experience the general effects of water immersion and exercise such as increased

function of the cardiovascular, respiratory, renal and immune systems. Mobility, muscle strength, stretching, pain relief and gait activities, e.g. walking across the width of the pool while blowing a sponge or ball combines gait and breathing control.

Group work in aquatic physiotherapy

- Aquatic physiotherapy provides the physiotherapist with a variety of ways in which they can treat patients.
- Patients can be treated individually in a pool on a one to one basis, while others may enter the pool as part of a group.
- Patients may be treated as a group even with different conditions and individual treatment programmes.
- Where patients have the same condition it is possible to include them in a group class, where they will have the opportunity to share their individual experiences with other patients who can be sympathetic and tend to have a high degree of empathy.
- Group work can engender comradeship, which can be used in a positive way to motivate patients to work hard at their exercises.
- Groups may interact socially and sometimes appropriate levels of competition can be introduced to assist them to achieve their rehabilitation goals.

An example of group interaction

Total knee arthroplasty class

- Each patient would be referred into the pool because they are struggling with some aspect of rehabilitation.
- There are identified problems of achieving either desired knee flexion or extension.
- The patients have been given a programme of exercises to increase the range of motion, strength, core strength and exercise tolerance.
- Each patient will have their range of motion measured and they will tend to compare the amount of improvement with other group members.
- The patients will tend to be motivated to work harder by each other (external motivation), whereas patients that have individual programmes have to motivate themselves (internal motivation) to achieve progress through exercising.

Clinical examples of the application of aquatic physiotherapy

- The following case studies show how physiotherapists can use a range of treatment techniques that can be tailored to a variety of patient presentations.

- These case studies are based around 'real life' reports by experienced aquatic physiotherapists based in different units around the UK .

Case study: acute back pain

- Background
  - The patient was 3 weeks postpartum and had suffered from severe right sacroiliac joint (SIJ) pain in the final weeks of her pregnancy.
  - She was still experiencing severe levels of pain (VAS 10/10) and could only walk with crutches.
  - The patient had been referred for outpatient physiotherapy; however, the therapist had been unable to palpate her spine due to the intensity of her pain.
  - SIJ disruption was diagnosed by an extended scope physiotherapist (ESP).
  - Electrotherapy modalities (Interferential therapy, TENS, acupuncture) were tried to reduce pain, with no benefit being gained.
  - The ESP felt that Maitland's joint mobilisations were indicated, but not possible at present.
  - The benefits of trying aquatic physiotherapy were discussed by the ESP and the pool therapist and it was agreed to try this as a means of mobilising the SIJ.
- Treatment outline
  - Session 1
    a. The patient was placed in supine floating for 20 minutes to facilitate general relaxation and to allow gentle movement of the spine via the movement of water.
    b. 'Sea weeding' (dragging through the water while keeping a steady side to side movement) from shoulders was used by the physiotherapist to encourage movement with minimal pain.
  - Session 2
    a. Supine floating (10 minutes) was repeated, in addition to sea-weeding from both legs and sea-weeding from the right leg only to enable mobilisation of the right SIJ.
    b. Standing in deep water with gentle leg swings (alternate legs) was used to encourage active movement, with minimal weight bearing.
    c. Supine floating with active alternate and bilateral leg abductions was also included into treatment during the session.
  - Session 3
    a. The patient reported an improvement in pain levels (VAS 7/10). Treatment was repeated as per session 2 with the addition of a passive left rotation stretch being performed by the physiotherapist to the point of discomfort. Following this the patient was found to be sufficiently relaxed to enable joint mobilisation to be performed in the water.
    b. Buoyancy-assisted rotations to the left were taught and the patient was passed

back to the outpatient therapist to be taught stabilising exercises and self mobilisations.

– Postscript

a. The patient called 2 days later and reported that her pain was much better (VAS 1/10).

b. She reported that she no longer needed the support of the crutches and she was continuing the exercises as these were continuing to help.

c. The patient also said that she was convinced that without the aquatic physiotherapy she would have been suffering her symptoms for a much longer period.

Case study: cerebral palsy

- Background
  - 'Jason' a 17-year-old boy with cerebral palsy, who can walk unaided for short distances.
  - His condition has resulted in him having a spine that is side flexed to the left all the time, and he walks with flexed knees with hardly any hip movement.
  - On his initial assessment it was agreed with his parents that aquatic physiotherapy would provide the best options for improving Jason's flexibility and strength.
  - Jason liked the water, and it was agreed that Jason would attend with either his parents or a carer, so that the physiotherapists could work with them to take over his treatment in the longer term.
- Treatment outline
  - Early sessions

    a. Early treatment concentrated on stretching out the tight left side.

    b. Using the warmth of the water made this goal easier to achieve as it facilitates a lowering of high muscle tone and in addition enables patients to relax.

    c. The physiotherapist used sweeping, taking Jason through the water to stretch the left side using the resistance of the water.

    d. Buoyancy was used with Jason being placed in left side lying the movement of his lower body and legs towards the surface producing a stretch in the tight left side.

    e. The stretching proved helpful, and similar techniques and stretches also helped to improve mobility in his hips and tight hamstrings.
  - Later sessions

    a. Once Jason was more flexible the physiotherapists concentrated on improving his balance by getting him to stay still while the water was swept around him.

    b. To improve his muscle tone techniques such as rolling and correcting his position, tipping side to side and stopping the movement part way through were incorporated into his treatment.
  - Postscript

a. Jason regularly goes swimming with his parents or carers.
b. They and Jason all report that he is much more flexible and has much improved balance. He has also noted improvements in his walking abilities and his levels of stamina have markedly improved.

Case study: pain management

- Background
  - A 29-year-old female police officer was referred for physiotherapy following an injury sustained during a violent arrest.
  - She initially complained of neck pain, back pain and right hip pain.
  - She was referred for aquatic physiotherapy after an initial assessment in outpatients.
  - The aims of aquatic physiotherapy were to decrease her pain, increase her range of movement in her lumbar spine, thoracic spine, cervical spine and right hip as well as regaining strength in her core and lower limbs.
  - 'Sally' was very low in mood when she started aquatic physiotherapy as she was keen to get better quickly and return to work.
  - She had been carrying out the advice she had been given on dry land, but had completed her programme vigorously in the belief she would get better quicker and had made her symptoms worse.
- Treatment outline
  - Early sessions

    a. Sally was introduced to the pool and a gentle range of motion programme was commenced with an element of relaxation carried out by floating her supine in the pool.
    b. She responded well to the graded movement programme, initially regaining confidence in trying to move her right hip.
    c. This was carried out over a 3-week period.
    d. After gaining confidence in the pool, strength work for the trunk and lower limbs was introduced. This consisted of using buoyancy-resisted exercises and drag to increase strength.
    e. Trunk flexion and extension was maintained by carrying out movements holding onto the rail at the pool side.
    f. At this time Sally complained of a particular tender spot around her right scapula, therefore as part of the holistic approach to her treatment she received trigger point acupuncture on dry land to release the tight muscles identified around her shoulder girdle. This treatment enabled Sally to continue with the exercises in the pool.
    g. She continued to improve her lower limb strength and core stability over a period of 7 weeks.
  - Later sessions

   a. She completed an initial course of aquatic physiotherapy and asked for a review on dry land in order to gain advice about returning to work.
   b. Sally was still struggling to manage pain so she was referred to a pain management group. She commenced a pain management programme in the aquatic physiotherapy pool while completing a course of acupuncture.
   c. Gua Sha and cupping on dry land was introduced to help relieve tight trigger points and promote some relaxation and well being.
   d. The aquatic physiotherapy programme ran for 10 weeks, consisting of a graded programme of exercises aimed at maintaining range of movement, building strength, promoting the ability of the patients to relax and improve their well being.
   e. The programme commenced with trunk movements of flexion, extension, trunk side flexion and rotation. Lower limb hip flexion and abduction movements were included and calf raises and squats were included to promote range of movement and the muscle activity associated with the movements. The exercises were commenced with 6 repetitions initially, increasing to 12.
   f. All movements were performed without pain and as soon as the patients could complete 12 repetitions comfortably buoyancy aids were introduced to make each task a little harder.
   g. Side flexion was carried out with blocks in hands to facilitate stretching. Hip flexion and abduction was carried out using either an arm band or a woggle.
   h. Core strengthening was introduced by pushing and pulling a kick board back and forth or cycling in the corner of the pool.
   i. The patient practised gait exercises in the pool walking tall initially, then walking and pushing buoyancy aids in front to provide resistance.
- – Post Script
   a. Sally was able to complete the programme and has managed to return to work on a phased return programme.
   b. She is currently working on her strength and endurance in order to return to beat duties. Her pain is controlled; she feels more positive in her attitude and is planning to apply for specialist training that could lead to promotion in the coming year.

Case study: ankylosing spondylitis

- Background
   - ‘John’, a 19-year-old boy with AS, was diagnosed two years ago and had been attending the local National Ankylosing Spondylitis Society (NASS) group on a weekly basis.
   - He is a builder by trade.
   - He was experiencing an acute flare-up of the condition in his left hip, which caused him severe pain and had consequently forced him to take time off work. This he did

reluctantly as he works as a self-employed builder.
- When he woke up in the mornings he was experiencing prolonged stiffness, finding it difficult to move.
- It was taking him half an hour to get ready in the morning and he could walk only with the assistance of two elbow crutches.
- He felt mornings were made easier by having a hot shower and doing some gentle exercises.
- Due to the enforced inactivity, other joints started to stiffen up as well and his posture began to take on an increasing stoop.
- He was sleeping badly at night, on average for 2 hours and tended to doze off during the day, lying slouched on a settee, watching television.
- On his initial assessment the Bath Ankylosing Spondylitis Metrology Index score was 4/10, where previously it had been between 1 and 2 (Jenkinson et al 1994).

• Treatment outline
- Early sessions
  a. During the first aquatic physiotherapy session John carried out walking, moving up and down the pool in the deep end up and down in the deep end of the pool.
  b. Subsequently his whole body was immersed in water, which helped to ease the pain and to relax his muscles. The physiotherapist also carried out some 'sea weeding' and in addition whilst John was floating on his back, supported by floats, the physiotherapist walked backwards and moved John's body gently from side to side through the water, using the drag effect.
  c. This resulted in a gentle stretch of his trunk side flexors and generally aided his relaxation. That night he slept a lot better and undisturbed for 6 hours.
  d. In the next few sessions, John also did some gentle buoyancy-assisted stretches for his hamstrings and quads, using a small float on his foot.
  e. He also performed some hip abduction and adduction, with neutral buoyancy whilst floating supported by floats in supine.
  f. John had progressed from using crutches to walking with one stick held in the opposite hand to his symptomatic hip.
- Later sessions
  a. As he started to feel better, he was able to introduce some water aerobics, i.e.: jogging and jumping in the deep end, with the full support of the water, so that it didn't aggravate his joints. Whilst jumping he moved his legs apart and together, gradually increasing the mobility of his hip abduction.
  b. On his last session he used larger floats for the stretches, added a stretch for the hip adductors and also did some buoyancy-resisted exercises.
  c. While he was lying on his back, he pushed a ring (around his ankle) down against the buoyancy of the water, working the hip extensors concentrically down into the pool and eccentrically as the leg raised up from the bottom of the pool with buoyancy. He performed this exercise with his trunk in an

extended position in order to counteract the stooping posture.

d. By that time he was quite comfortable doing his walking in the shallow end and he was able to do this in a backward and sideways direction as well.

– Postscript

a. When he was measured again, his BASMI showed improvement at 2.5, not quite back to where it used to be.

b. Pain was greatly reduced and he had given up the use of walking aids as he no longer felt the need for the support.

c. He was planning to return to work in the short term and had rejoined the local NASS group. Initially taking part in the aquatic physiotherapy class, then after another month he joined in with the dry land sessions as well.

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Chapter 3

E-materials

Acknowledgements

Stephanie Taylor, Aquatic Physiotherapist, Nuffield Orthopaedic Centre, NHS Trust.
Mr Alan Hazlett

Author profiles

Dr Anne Jackson PhD MSc BA(Hons) MCSP

Anne Jackson has been a specialist in aquatic physiotherapy for much of her career, working clinically in the South of England. Her PhD thesis focused on outcomes and patient experience of aquatic physiotherapy. She was editor of Aqualines, the Journal of the Aquatic Therapy Association of Chartered Physiotherapists, from 2003 – 2010 and has been a frequent author of a range of papers in this journal. She has been involved with establishing the international group Aquatic Physical Therapy International. Anne currently works for the Chartered Society of Physiotherapy.

Cathy Stringer BSc(Hons) BEd MCSP

Cathy qualified as a physiotherapist in 2004 after a career change and has been employed by Good Hope Hospital, Heart of England Foundation Trust ever since. She completed my junior rotations and chose to specialise in musculoskeletal out-patients, where she divides her time between working in the hydrotherapy pool and working in the out-patient

department treating patients with chronic pain problems. Cathy has been instrumental in developing the pool services to include classes for hip and knee arthroplasties, Bad Ragaz for shoulder rehabilitation and ante-natal classes and has plans for further initiatives to be developed in the future.

Alison Skinner

Alison Skinner has worked in physiotherapy education at the Middlesex Hospital School of Physiotherapy and later at University College London specialising in Aquatic Therapy. She has taught Aquatic Therapy both in the UK and internationally for many years. Her qualifications include certificates in hydrotherapy following a 6 month course from the Chartered Society of Physiotherapy and a senior lecturer's certificate from the International Halliwick Association. She has written articles for a variety of publications and co-edited Duffields Exercise in Water. Currently she is Treasurer of the Aquatic Therapy Association of Chartered Physiotherapists.

Susie Grady MSc BSc(Hons) MCSP

I work as the Aquatic Therapy Team leader at The Gardens and Jacob Neuro-rehabilitation centres in Hertfordshire, UK. These centres are part of the Ramsey Healthcare group. I am responsible for delivering the Aquatic Therapy service to our clients who all have

neurological conditions.

I have served on the ATACP committee for 6 years and have held the position of Research Officer and CPD Co-ordinator.

I have also gained a Masters Qualification in Veterinary Physiotherapy, and work as a self-employed Veterinary physiotherapist with both horses and dogs. I am a category A member of ACPAT and my research project investigated the use of canine hydrotherapy in the UK and abroad.

www.4legsphysio.co.uk.

Ankie Postma GradDipPhys

Ankie Postma is a physiotherapist working part time at Basildon Hospital, Essex, UK. She has responsibility for the Aquatic Physiotherapy service in her district, but her caseload includes amputees and patients with ankylosing spondylitis as well. She undertook the 'Bath Hydrotherapy Course' in 1994, after which she joined the ATACP committee, where she has been the minute secretary for many years. Apart from her NHS work, she is involved in the local NASS group and 'WADERS' (Water Assisted Disability Exercise and Rehabilitation Scheme), an exercise group for people with mobility problems, in local leisure pools.

and rotations using the elbows in the water to create resistance to movement "Helicopters".

- Outcomes
  - Final rehabilitation was progressed to exercises on land in a gym.
  - At this point the patient had begun to return to work on light duties which were progressed gradually back to his normal levels of workload.

Case Study 2: Spinal cord injury

Background

- "Dave" is in his 50's and had a car crash 6 years ago which left him with a T10 paraplegia.
- He was referred to physiotherapy to promote upper body strength, as he was having difficulty transferring to and from his wheelchair.
- Following assessment the physiotherapist considered that the pool would be the best environment to manage his disabilities and produce the desired improvements in his upper body strength.

Treatment outline

- Early sessions
  - Dave had always been nervous of water and was a non swimmer.
  - Initially it was important for Dave to gain confidence in being immersed in the water.
  - This was done by demonstrating how water is a supportive medium.
  - Once he had gained some confidence techniques such as pushing down into the water against floats, moving paddles through the water, and pushing against the physiotherapist (commonly known as Reversal techniques) to move himself through the water were used to strengthen the arms and upper body.
  - Dave was supported by floats attached to his body to provide additional reassurance when exercising.
  - He reported that his ability to transfer from his chair had improved and it felt easier.
  - He continued to find exercise on land difficult, especially any exercise to improve his general fitness.
- Later sessions
  - It was suggested that Dave consider learning to swim as a means of exercising in a way that he could manage. Although reluctant at first, he agreed to try this.
  - To ensure that Dave could feel safe and be independent in water it was necessary to ensure that he could always get himself into a safe breathing position.

- This was done by working on his ability to get from front to back and visa versa, both side to side and front to back (Transversal and Longitudinal Rotations).
- Because of his lack of confidence in water this took a longer time than expected.
- He eventually became proficient enough to be deemed safe by the physiotherapist and importantly felt safe himself.
- Dave was taught a swimming stroke that is recommended for his type of disability, which is similar to double over arm backstroke.
- He managed this well, but again it took a few weeks before he felt truly confident that he could maintain his balance in the water whilst swimming.

- Outcomes
  - Dave now goes to his local pool on a regular basis, and on his last attendance he stated that the aquatic physiotherapy had opened up a whole new life for him, as in the water he could move and exercise independently, something that he found almost impossible on land.

Case Study 3: Total knee replacement class

Background

- A 69-year-old male was referred to hydrotherapy following a right total knee replacement.
- The patient lived alone in a house with one flight of stairs.
- He struggled to ascend and descend the stairs reciprocally.
- He had hypertension, which was controlled by medication.
- He was retired, but carried out a small part time job to keep active. He also enjoyed cycling, but was unable to cycle due to limited movement and pain in his right knee.

Assessment

- The patient visited outpatient physiotherapy for his initial assessment.
- At this time he was complaining of pain in his right thigh that he described as pressure.
- He also had pain tracking down his right tibia, tightness in his right calf and decreased movement in his right knee.
- Right knee flexion measured 80°, extension was 15° from full extension. Left knee had 0°–130° flexion.
- His strength was grade IV through available range of active knee flexion / extension.
- He was able to sustain an isometric quadriceps contraction and straight leg raise without any lag.
- The right knee was painful to palpation over the patella tendon and on the lateral border of the patella and knee joint line.

- He complained of 7/10 pain (VAS scale) when weight bearing on his right leg.
- There were no direct contraindications and no relative contraindications to hydrotherapy. His hypertension was controlled with medication, which was noted as a precaution for entering a hydrotherapy programme.

Problem List

- Pain when weight bearing through affected leg (right leg).
- Loss of range of movement −15° extension to 80° flexion.
- Decreased balance less than 30 seconds.
- Decreased lower limb strength.
- Decreased exercise tolerance.
- Decreased confidence using new total knee replacement.

Goals

- Decrease pain to 2/10 VAS.
- Increase range of movement (−5° to 100° active knee flexion).
- Maintain / increase muscle strength to grade IV–V (Oxford scale).
- Increase exercise tolerance.
- Increase confidence in using new total knee replacement.

Treatment

- The patient was allocated a place into a hydrotherapy total knee class programme.
- The programme ran for six weeks and consisted of range of movement exercises, lower limb and core strengthening, gait re-education, balance and proprioception exercises.
- Each session ran for 30 minutes and started with a warm up of marching at the wall or up and down the pool.
- Treatment consisted of buoyancy assisted exercises using both the water and buoyancy aids to regain movement; lower limb and core strength work using turbulence, buoyancy resistance and drag.
- The patient also received exercises for improving balance standing on both legs progressing to standing on one leg, with turbulence being used to challenge balance and gait.

Outcomes

- After completing the total knee replacement programme the patient reported a decrease in pain when weight bearing (0/10 to 2/10 VAS).

- He had achieved 0°–108° active knee flexion.
- Balance standing on one leg had increased to more than thirty seconds.
- His strength remained at grade IV (Oxford scale).
- The patient reported that he had increased confidence in his total knee replacement and felt able to return to his part time job.
- He reported that he found the group setting really helpful as all the patients in the group had total knee replacements and they were able to discuss their experiences of surgery and recovery and also encourage each other during the programme.
- He felt reassured that he was not the person experiencing pain and discomfort and that his recovery of movement had progressed at an expected rate.
- He had not attempted to ride his bike due to bad winter weather, but intended to try cycling once better weather returned.

Chapter 3 Aquatic physiotherapy multiple choice questions

1. Which is not a physical property of water?
   a). Buoyancy
   b). Turbulence
   c). Cohesion
   d). Metacentre
2. Which of the following statements is true? The apparent weight relief gained from buoyancy is:
   a). Equal to the weight of the water displaced
   b). Less than the weight of the water displaced
   c). More than the weight of the water displaced
   d). Dependent on the weight of the object.
3. A person with a high proportion of adipose tissue will:
   a). Float less easily?
   b). Float more easily?
   c). Be more stable in water?
   d). Need a neck collar at all times?
4. Which is not a factor for stability in water?
   a). Distribution of densities
   b). Weight of the object
   c). Shape of the object in the water
   d). Depth of the water
5. Does slow movement in the water require:
   a). Low energy input?
   b). High energy input?
   c). The speed of movement does not make a difference?
   d). Flotation devices?
6. Which of the following is correct?
   a). Movement runs parallel to pressure differences in water

b). Movement occurs from an area of high to an area of low pressure
c). Movement occurs from an area of low pressure to an area of high pressure
d). Movement varies according to surface tension

7. Which of the following is correct?
a). An object with a relative density of less than 1.000 will sink
b). An object with a relative density of less than 1.000 will roll in water
c). An object with a relative density of less than 1.000 will float
d). An object with a relative density of more than 1.000 will float

8. How many ml of blood is redirected to the central thoracic space on immersion to the sternal notch?
a). 400 ml
b). 700 ml
c). 100 ml
d). 1000 ml

9. What is the range of water temperatures regarded to be within the thermoneutral range?
a). 35–36°C
b). 33.5–35.5°C
c). 30–33°C
d). 36–38°C

10. Which of the following is not a physiological change in the heart when immersed to the sternal notch in thermoneutral water?
a). Cardiac output rises by 30%
b). Stroke volume rises by 50%
c). Diastolic pressure drops
d). Heart rate rises by 30%

11. Which of the following is a physiological change in the respiratory system during immersion to the sternal notch?
a). Vital capacity drops by 5–10%
b). Functional residual capacity drops by 30–60%
c). Breathing effort increases by 58–60%
d). All of the above

12. Which of the following is a physiological change in the renal system during immersion to the sternal notch?
a). Urine production falls by 420% by the third hour
b). Urine production rises by 6 to 7 fold
c). Sodium excretion fall by 2–3 fold
d). Anti-Diuretic Hormone production increases

13. Which of the following is a physiological change in the sympathetic nervous system during immersion to the sternal notch?
a). Noradrenalin production falls
b). Sympathetic activity increases peripheral circulation resitance
c). Suppression of sympathetic activity

    d). There is no change
14. Which of the following is not an absolute contraindication to aquatic physiotherapy?
    a). Acute diarrhoea and vomiting
    b). Proven chlorine allergy
    c). Open infected wounds
    d). Paroxysmal nocturnal dyspnoea
15. Which of the following is not a relative contraindication to aquatic physiotherapy?
    a). Irradiated skin following recent radiotherapy
    b). Poorly controlled epilepsy
    c). Weight of the patient exceeds the weight limit of the evacuation equipment
    d). Unstable diabetes
16. Which of the following is a precaution for aquatic physiotherapy?
    a). Haemophilia
    b). Hypertension
    c). Veruccas
    d). Poor circulation
17. Eccentric muscle work in water is obtained by:
    a). Letting a float up to the surface slowly
    b). Pushing a float down away from the surface
    c). Sweeping a limb quickly through the water
    d). Holding a float still in the water
18. A movement can be improved in range by:
    a). Moving a limb briskly through the water
    b). A therapist creating turbulence around a limb
    c). Moving a float down away from the surface
    d). Letting a float move up towards the surface
19. Which of the following is not a technique that will allow muscle strengthening?
    a). Moving a limb briskly through the water
    b). Pushing a float down away from the surface
    c). Holding against the effect of drag
    d). Letting a limb move with drag
20. Standing still in deep water with the head tilted back
    a). Mobilises the thoracic spine
    b). Strengthens the trunk flexors
    c). Strengthens the trunk extensors
    d). Increases the workload on the shoulder retractors

Aquatic physiotherapy multiple choice answers

1. c)
2. a)
3. b)
4. b)

5. a)
6. b)
7. c)
8. b)
9. b)
10. d)
11. d)
12. b)
13. c)
14. c)
15. c)
16. a)
17. a)
18. d)
19. d)
20. b)

Chapter 4

Burns and Plastic Surgery

Introduction

- Early intervention of therapy is imperative for a successful outcome in burns management.
- From admission, splinting, positioning and exercises all become part of the patient's daily routine.
- The patient and team commitment to treatment and restoration of function is vital in order to achieve good outcomes.
- Careful consideration of the care, rehabilitation and management of multiple problems in this group is needed by a multidisciplinary team.
- A clear insight into the reasoning processes that enable treatment progression and decision making is vital.
- The ultimate goal is to assist the patient to return to their preinjury status, or as near as possible, physically, psychologically and functionally to this.

The burns team

- The team consists of a number of dedicated professionals, who have a variety of roles in the management of a burns patient (Table 4.1).
- The roles of the team will overlap and merge in units around the country; they have been listed above to provide an indication of the variety and diversity of skills needed by each professional.
- For the purposes of this volume, treatment has been divided into pre- and post-healing stages.

Table 4.1 The burns management team

Surgeons	Psychologist
Burn resuscitation Wound care Debridement and grafting Nutrition Prescription of medication	Psychological support

Nurses	Physiotherapist
Wound care and dressings Administering of medication Fluid monitoring Emotional support	Respiratory treatment Maintain joint range Prevent contractures Increase muscle power and function Mobility
Dietician	Occupational therapist
Nutrition Swallow assessments	Scar management Prevent contractures Emotional support Discharge planning Functional restoration
Social worker	
Discharge planning Psychosocial needs Assistance with financial claims	

Pre-healing stage

Acute medical management

- This will include pain management encompassing sedation if necessary, giving humidified oxygen, maybe via continuous positive airways pressure (CPAP) or intermittent positive pressure ventilation (IPPV) to maintain gas exchange, fluid resuscitation, feeding (possibly via nasogastric (NG) tube), dressings, excision and grafting.

Respiratory physiotherapy treatment

- Standard respiratory physiotherapy assessment and treatment techniques apply, but there will be a few key differences.
- The effect of smoke inhalation and thermal injury has been covered in Volume 1 of this book.
- Inhaled smoke will affect the respiratory function of patients.
- They may not initially present with any signs of underlying respiratory damage; however, they can deteriorate rapidly and may need admitting to an Intensive Care Unit at short notice.

- The therapist must be mindful of the patient's pain levels and especially of the location of the burns when performing manual treatments.
- Graft sites must not be disturbed for at least 5 days postoperatively, to avoid shearing, although respiratory problems will take precedence over the burns as they are more likely to become life-threatening.

Aims of physiotherapy treatment

- Maintenance of the airway.
- Removal of secretions.
- Improvement of gaseous exchange.
- Prevention of atelectasis.
- Maintenance of thoracic expansion and general mobility (Keilty 1993).

Intubation

- This may be necessary, especially if the patient is suffering from facial or neck burns, with accompanying oedema, or poor blood gases.
- Intubation can be by endotracheal tube, or tracheostomy, and can allow mechanical ventilation to be used.
- IPPV is required in patients with respiratory failure, with this being indicated by:
  - Hypoxaemia (paO_2 less than 8 kPa with an inspired oxygen concentration of 50%)
  - CO_2 above 7.5 kPa and rising
  - Falling pH
  - Increasing respiratory rate
  - Increasing pulse
  - Cyanosis
  - Exhaustion of the patient, and an inability to cough effectively
  - The patient is sedated
  - Pulmonary oedema.
- It is not the aim of this book to cover all respiratory treatments; however, the following treatments may be encountered in addition to ventilation:
  - The use of intermittent positive pressure breathing (IPPB) or CPAP may be sufficient, although facial burns would preclude the use of a face mask
  - Oxygen should be humidified and saline nebulisers may also be needed to improve dehydration in the airways, and assist secretion removal (Keilty 1993)
  - Postural drainage is contraindicated in the presence of facial oedema so treatment may need to be modified to positioning patients on their side and regular turning carried out
  - Suction must be gentle and minimal, and preferably only on intubated patients due to the damage to the nasal mucosa
  - Manual hyperinflation may be necessary if the patient is ventilated (Harvey-Kemble

and Lamb 1987)

  - Vibrations and shaking are contraindicated if there are graft sites on or near the chest wall, due to the risk of shearing
  - Patients will need regular monitoring of the blood gases, for signs of respiratory and metabolic acidosis, i.e. 'burns shock'
  - Constant monitoring of the respiratory system is necessary especially during treatment sessions, as these patients tend to be very unstable due to the major fluid changes they are experiencing
  - For example, the cardiac output can fall quickly during position changes, so must also be monitored closely
  - The burns patient is also at risk of developing adult respiratory distress syndrome (ARDS), with reduced lung compliance and associated raised airway pressures
  - This is caused by persistent pulmonary oedema, the formation of hyaline membrane and ultimately interstitial pulmonary fibrosis
  - Regular chest X-rays and blood gases will help the team identify any developing complications
  - Treatment will need to be applied little and often, to avoid fatigue
  - Burns patients can deteriorate quickly, particularly during the first week, and after recurrent surgical interventions
  - Even if there do not appear to be any chest complications the patient will need daily reassessment by a respiratory or burns physiotherapist.

Flaps and grafts

- Early excision and grafting is preferable for a number of reasons:
  - Increased rate of healing
  - Decreased mortality
  - Prevention of ischaemic compression
  - Decreased risk of wound infection
  - Decreased energy demand for healing
  - Decreased length of hospital stay.
- Skin grafts are used to facilitate healing in deep dermal or full-thickness burns.
- The most commonly used graft is a split-thickness graft (SSG), which contains a variable portion of the dermis.
- Burns are first debrided to a viable capillary bed; the donor skin is harvested and moved to cover burnt areas.
- The donor site will heal in 10–14 days; however, this can be very painful initially.
- A skin graft may be meshed to provide coverage of a greater surface area at the recipient site. The spaces between the meshing allow bacteria and fluid to drain.
- The appearance of the mesh will remain long term, which may influence the choice of graft used in cosmetically sensitive areas.
- Different types of split skin grafts:

- Autograft, uses the patient's own skin to provide permanent skin cover. Skin, however, may be limited in large burns and re-harvesting of donor skin may be necessary.
- Allografts or homografts use donor skin from another person. These grafts will not take in the long term. They are used to provide a temporary cover for 2–3 weeks to reduce pain, fluid loss and infection.
- Xenografts or heterografts involve the use of pig skin and can be used as a temporary dressing.
- Cultured skin and synthetic skin is a growing area of development. New grafts include cultured epithelial autograft (CEA), which uses skin cells from the burns patient to grow new cells in the laboratory. Other products include Integra that contains animal products with silicone to provide a permanent dermal substitute.
- A skin flap composed of skin and subcutaneous tissue with its own blood supply, may be required to cover exposed bone, tendon or joints, as a skin graft would not take, due to the poor underlying blood supply.

• Grafts and flaps over joints need to be immobilised with dressings and splints until the doctors are happy the skin graft has taken.
• At this point therapy can begin to manage the joint range.

Positioning

• This is fundamental for successful burns rehabilitation, in order to minimise chest complications and pressure areas, to enable wound care and healing, to decrease oedema and maintain tissues in an elongated state to prevent contractures.
• The areas of the body most likely to contract are the neck, axillas, elbows, thumb and finger web spaces, knees, ankles.
• If possible the patient should be turned regularly in the bed, and nursed on a pressure care mattress.
• Once they are out of the acute phase, they should be encouraged to sit out of bed for periods during the day.
• Patients with burns to the anterior neck should be nursed without pillows to prevent early contractures developing.
• Oedema will develop within a few hours of the burn injury and peaks at approximately 36 hours; therefore, consider elevation of the extremities, using foam slings, wedges or pillows.
• Positioning may be maintained with suitable splints, e.g. resting splints for the hands in a POSI, or foot-drop splints for the feet, which can be applied between treatments, or overnight only.

Positioning of the upper limbs

• Axilla burns, anterior chest, and lateral posterior trunk burns are prone to developing

contractures preventing shoulder abduction and flexion (elevation), therefore the shoulders must be positioned and stretched into these positions.

- Burns to the antecubital fossa lead to elbow contractures, especially as a flexed elbow tends to be a position of comfort for the patient to rest in.
- Elbow extension splints may be required at night, including the positioning of the forearm into supination.
- Elevation of the hands in Bradford slings designed to assist swelling control. If the shoulders do not permit this, then the hands should at least be elevated on pillows.

Positioning of the lower limbs

- Hips need to be positioned in neutral rotation and slight abduction using foam wedges, towel rolls or sandbags.
- Prone lying is an excellent position to stretch tight hip flexors, if the burns permit it and the patient can tolerate it for short periods.
- Knees should be positioned in extension when the patient is in the bed, avoiding use of a pillow under the knees, which would encourage flexion contractures.
- Plantar flexion contractures of the foot are the most common encountered, so the ankle should be placed in a neutral position, unless the burn is isolated across the anterior surface of the ankle and foot.
- This can be achieved with the use of splints, pillows, or foam.

Musculoskeletal treatment

- The aim is to maintain range of movement, especially over joints in the hands, which will contract quickly, if not stretched regularly.
- If the patient is conscious, it is important to encourage active movements.
- If the patient is not conscious then passive stretches will be necessary.
- It is essential to avoid being too aggressive or vigorous as this can rupture fine muscle fibres and vessels surrounding the joint, producing a haematoma within the joint space, which may eventually lead to fibrosis or heterotopic calcification (Richard and Staley 1994).
- Passive movements should be slow, gentle and controlled, aiming to achieve full range of movement.
- Donor sites can be moved and they will feel sore, but there are no restrictions to movement of this area.
- However, joints in close proximity to newly grafted sites must not be moved until the surgeon has agreed the graft has taken.
- This will be approximately 5 or more days post graft application.
- If a surgeon feels the graft has not 'taken' they may instruct the therapist to move the joint, until further surgical management can take place.
- Care is needed to avoid stressing areas of deep tissue damage, such as exposed tendons or

joints.

- Respect the patient's wishes and their tolerance of pain, although ultimately it is essential to treat in order to avoid long-term contractures.
- Patients tire easily during treatment, partly due to the increased energy expenditure that accompanies the loss of the skin barrier.
- They may lose up to 10% of their body weight during the post-injury period, despite careful monitoring of their calorie intake and nutrition.
- Therefore, careful consideration of the frequency and timing of treatments is important and liaison with the nursing and medical staff is essential to avoid clashes of treatment.
- Individual hospital policy or staffing may dictate whether the patient receives 5, 6 or 7 days of treatment in a week.
- Treatment may be carried out whilst the patient's dressings are in situ, although it is vital to view the burns during their healing phase, in order to facilitate good handling by the therapist and to predict areas of possible contractures.
- Assisting the nurses during dressing changes can be helpful, although once the dressings are in place they can help to cushion the therapist's hands and spread the pressure applied during the manual treatment.
- There is a high risk of infection due to the loss of the skin barrier, so use of infection control techniques is even more fundamental in the burns patient than usual.
- Liaising with the patient's relatives/carers is crucial, and they may be keen to be involved in their relative's rehabilitation, perhaps performing correctly taught passive movements between therapy sessions.
- The family should be educated regarding the aims and all other aspects of the therapy programme, including the benefits of treatment and the risks of non-compliance (Leveridge 1991).
- The advice may include some of the common adages relating to burns (Box 4.1).

Box 4.1 Common adages for the management of burns

- 'Mornings are always the worst due to stiffness from inactivity during the night'
- 'ROM first'
- 'Burn scar contracture is a lack of tissue to go around'
- 'Stretch opposite the burn, e.g. elbow extension if the burn is in the antecubital fossa'
- 'The sum of the parts does not always equal the whole' (i.e. may need to stretch multiple joints at a time)
- 'If it's white, it's tight and needs to be stretched'
- 'Pinching pain (to be avoided) or stretching pain (to be expected)'

Richard and Staley, 1994.

Mobility

- As soon as the patient is medically stable and coming out of the acute phase,

consideration of their mobility must be of prime importance.

- Transferring out of bed into a chair or wheelchair, followed by gait assessment and re-education can be carried out by the therapy team. This will include the provision of appropriate aids, seating and advice.
- If the patient has been in bed for a prolonged period of time, they may need to be treated on a tilt table initially to enable them to be brought gradually up into an upright posture.
- Likewise the gradual introduction of lower limb dependence ('dangling') may be required before the patient can tolerate weight-bearing on their legs.
- In the presence of grafts on the legs, the dressings must be covered with double Tubigrip when mobilising.
- If they have stairs at home, they must ascend and descend a flight of stairs prior to their discharge to ensure safety and independence.

Hand burns

- Initial elevation in a Bradford sling is vital to assist the reduction of oedema.
- The hand may be dressed, or may be enclosed in a Flamazine bag, which will be changed daily.
- The most common posture of an untreated burnt hand is with the MCP joints in extension, the IP joints of the fingers in flexion, and the thumb in adduction.
- This can be corrected with the use of thermoplastic splinting in the 'intrinsic plus' position, or position of safe immobilisation (POSI) between therapy treatments (wrist at 30–40°, MCPJs at 45–70°, IPJs in neutral and the thumb abducted), to maintain the length of the collateral ligaments and volar plates.
- The splint can be fabricated over the Flamazine bag or dressings, and adjusted regularly as required to ensure a good fit and therefore effective positioning of the joints.
- Active exercises can begin from day 1 post-admission if the patient is conscious and able to comply.
- If not, or if the amount of active movement is poor, passive movements are essential to maintain joint range and muscle length, as well as preventing contractures.
- The exercises are best carried out soon after analgesia has been administered, and preferably without the dressings in situ.
- Passive flexion should be avoided if there is damage to the extensor apparatus of the fingers, otherwise exercises should consist of taking all affected joints through their full range of movement, or as near as the patient can tolerate if they are in pain.

Burns dressings

- The qualities of a good dressing are that they have high humidity but allow removal of excess exudate, they are impermeable to bacteria, are comfortable and last long enough to avoid frequent changing (Appendix 4.1).

Post-healing stage

- Once the patient is discharged from hospital they will need to continue their care as an outpatient.
- This will probably take the form of hospital outpatient visits, in which they will be seen by a number of team members.
- Dressings will generally be managed by the nursing team.
- Monitoring of healing will be carried out regularly by the surgeons, with the planning of future surgery, if necessary for any further grafting on unhealed areas, scar revision or contracture release.
- The patient will need provision of a tailored home exercise and stretching programme and this will need regular reviews and the addition of appropriate progression.
- Range of movement should be recorded at each therapy session using a goniometer.
- Graded muscle-strengthening exercises involving exercise bands, weights and springs can increase muscle strength, whilst aerobic exercise, such as using an exercise bike, will improve endurance and stamina.
- The patient should be setting goals in conjunction with the therapist, in order to keep motivation levels high, and to ensure that there is tangible progress to measure.
- The community team may be able to help with nursing or therapy provision for those patients who are unable to travel back to the burns unit on a regular basis.
- These health professionals will need to liaise closely with the hospital team, especially if additional information or technical skills are required.
- Aids or adaptations may be required in order to promote self-care activities once the patient has been discharged.
- Splints for positioning and stretching are likely to be an ongoing necessity, so regular appointments will be required to ensure correct fit and continuing effectiveness.
- Family members are often keen to offer support, so it may be useful to compile a list of activities the patient can manage independently and those with which he or she requires assistance.
- Patients may need assistance from members of the therapy team with tasks such as filling in disability claim forms or advice about driving and the questionnaires associated with this.

Scars and healing

- Often a scar settles within 2–6 months, to become white and appears as a fine line. However, scars can become keloid or hypertrophic.
- Keloid scarring is scar tissue which goes beyond the original parameters of the wound, and expands into the surrounding tissue.
- It is often bulky and can be shiny, or red and painful to the touch.
- The type of scar formed after a burn will depend on the depth, type and location of the

burn on the body.

- It is very difficult to predict, unless the patient has previous scars which have become keloid, although it is most common in people with Afro-Caribbean heritage.
- Certain areas will be more prone to hypertrophic scarring, e.g. over the sternum, deltoid and the ear (O'Brien 2008).
- Generally it seems that if the burn is healed within 3 weeks the scarring will be minimal, but if this takes longer than 3 weeks the scar is likely to be significant and will probably require some form of treatment.
- Hypertrophic scars are raised, itchy, lumpy, red and painful, and typically develop a few months after the burn, once the site has epithelialised.
- Scars can be seen to get worse within the first 3–6 months before they improve, which needs to be communicated to the patient, so they are forewarned and do not become dispirited by what seems to be a deterioration of their situation.
- Keloid scars extend beyond the original site of the injury and can stay active for several years.
- Contributing factors to hypertrophic scarring include: age, location of the scar, depth of the burn, skin tension and race.
- These types of scars are prevalent in 70–80% of all scars following burns.
- The aims of scar management are to prevent or reduce functional limitation, reduce pain and irritation and to gain an optimal appearance.

Scar management

- The approach to scar management includes the following:
  - Creams
  - Scar massage
  - Stretching and exercise
  - Silicone gels and elastomers
  - Pressure garments, to help make the scar softer, flatter and paler in colour
  - Steroid injection – if unresolved scar in an obvious place.

Creams

Grafted skin tends to dehydrate and requires regular moisturising with aqueous creams, to avoid blistering, cracking and overgranulation of the skin (Richard and Staley 1994).

Scar massage

The aim of massage is to break down collagen that has been produced in response to the burns, or other soft tissue injury and thus relieve underlying tethering, as well as assisting desensitisation. Care must be taken on newly healed skin grafts, to prevent shearing or blistering of the fragile skin (Richard and Staley 1994). Once healing has been established, deep tissue massage and frictions break down the excess collagen formation and encourage

the matrix to form along the most functional lines (Hunter 1998).

Stretching and exercise

Regular stretches and exercises are required from the time the burns and skin grafts are healed, to prevent the development of contractures and assist in the elongation of the scar tissue, especially that which extends over one or more joints (Richard and Staley 1994). Scarred areas in soft tissue mimic the tissue they replace but it is difficult for them to replace it completely. The application of movement and forces across the healing tissues encourages the collagen matrix to form with the most suitable tensile strength to encourage it to replicate the damaged tissue as closely as possible (Hunter 1998).

Silicone gels and elastomers

It is not fully understood just how these work and there is very little evidence to support their clinical use. However, anecdotally they have been found to be very beneficial. Current research theorises that the gel promotes hydration of the scar, by means of the reduction of water vapour loss reducing capillary activity and therefore reducing collagen deposition (Sepehrmanesh 2006).

Pressure garments

The physiological effects of pressure garments are also not fully understood. There are two theories that are referred to in the literature: the first is that the pressure applied causes increased stasis, leading to a reduction in the fibroblastic activity and therefore the production of collagen. This would account for the decrease in the mass of hypertrophic tissue to promote faster maturation of healing tissue (Edwards 2003). The second theory is that the pressure garments reduce the blood flow to the covered area, and the levels of gamma globulins which would otherwise inhibit the scar remodeling process (Williams et al 1998).

- Pressure garments are deemed unnecessary if the grafts have taken early or are healed within 2–3 weeks.
- A scar must be fully healed for a pressure garment to be fitted.
- There are advantages and disadvantages to using pressure garments (Table 4.2).
- Pressure garments may need changing every 6–12 weeks, depending on the patient's activity levels, and change in their weight or muscle bulk after discharge from hospital.
- The garments are likely to be needed for as long as the scars are active, i.e. approximately 12 months or longer (Figure 4.1).
- Ultimately the scar should flatten and fade to a paler colour.
- In addition to the disadvantages of wearing pressure garments there are a number of complications associated with wearing them, e.g. swelling, blistering and scar breakdown.
- Scars can be monitored for varying factors using tools such as the Vancouver scar scale

(Table 4.3).

Table 4.2 Advantages and disadvantages of pressure garments

Advantages	Disadvantages
Custom made, therefore fit well and can be adjusted The patient can function fully within them Improvements can be noted relatively quickly	They need to be worn 23 hours per day Patients can find them hot and rather cumbersome The garments are expensive They are labour-intensive to make, and require specialist skills

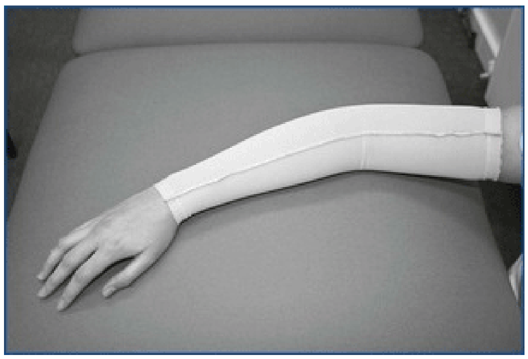

Figure 4.1 Pressure garment.

Table 4.3 Vancouver scar scale

Pliability	0	Normal
	1	Supple
	2	Yielding
	3	Firm
	4	Adherent
Height	0	Normal
	1	1–2 mm
	2	3–4 mm
	3	5–6 mm
	4	6+ mm
Vascularity	0	Normal
	1	Pink
	2	Red
	3	Purple
Pigmentation	0	Normal
	1	Slightly

	2	Moderately
	3	Severely

Baryza and Baryza (1995).

Protection from the sun

- Education on protecting the scar from exposure to sunlight is essential. Risk of sunburn is increased due to the newly healed skin having none of the protective pigment normally found in skin and therefore being highly sensitive to ultraviolet rays the patient is particularly vulnerable to the adverse effects of sunlight.
- Patients are instructed to avoid sun exposure for at least 1 year after a burn and to use a high-factor sunscreen on areas of skin which cannot be covered up.
- Cosmetic camouflage has been developed to diminish the distress of facial and hand scarring, in order to improve the patient's self-esteem.
- The correct application of the waterproof opaque creams can cleverly disguise disfiguring scars and these usually contain a sunscreen.

Psychological aspects of burns

- The psychological effects of burn injuries cannot be underestimated, although for most patients they are temporary.
- Psychosocial care is essential following a burn, and this may be carried out at different times by all members of the team, e.g. nursing staff, OTs, physiotherapists, social workers, psychologists and medical staff.
- Common complaints in the early post-burn period are anxiety, sleep disturbance, confusion and delirium.
- The focus in the initial management of a burn patient tends to be on immediate survival and physical problems. The team should follow the patient's lead and only confront the long-term implications of the injury if this is directly requested by the patient.
- Family members should be encouraged to avoid showing their own anxiety in front of the patient. They should be encouraged to appear calm, hopeful and supportive.
- Once out of the ITU setting patients will often begin to experience more negative emotions, such as depression, post-traumatic stress disorder, nightmares and anxiety.
- The majority of patients learn suitable coping mechanisms to deal with their situation, but sometimes stronger behavioural problems such as direct hostility, regression or dependence can manifest themselves.
- At this stage it is extremely helpful if an experienced burns psychologist or psychiatrist can become involved in the patient's care, and give guidance to other team members and the family on how to react and handle these behaviours.
- When patients are discharged from hospital they have to go through an emotional readjustment, with ongoing anxiety and depression a clinical feature of the first year post-injury.

- Functional incapacity and burn disfigurement can lead to low self-esteem and social withdrawal.
- Support from other burns patients can be invaluable and may help the patient to reintegrate into their normal life again, which can be a difficult and emotional process after a long period in hospital.
- There are many self-help groups available for burns patients, in particular patients may need advice and support regarding the return to work or school.
- Long-term adjustment difficulties are influenced by a complex mix of personality, environment and extent of injury, so psychological support has to be tailored to each individual, to make the most of that person's own coping skills.

Paediatric burns (Richard and Staley 1994)

- The major differences in the paediatric burn are as follows:
  - Body surface area is different to adults (Figure 4.2)
  - Body surface area to weight ratio is larger
  - Skin is thinner, so burns are often deeper
  - Dehydration is a common problem
  - Burns greater than 10% TBSA require formal fluid resuscitation
  - Temperature control is more difficult and hypothermia is a common complication
  - Burns in young paediatrics have a higher mortality rate
  - Scarring is more severe and scar maturation is more prolonged, meaning scar management techniques need to be continued for many years
  - Young children do not or cannot always co-operate with treatment
  - Parental/guardian distress, anxiety and sometimes guilt
  - Developmental progress must be closely observed to ensure that motor skills, language, cognition, social and emotional development continue as expected
  - Any suspicion of non-accidental injury needs to be carefully addressed, with referral on to the appropriate social care services (Leveridge 1991).

Child body Part	% of total BSA
Arm	9%
Head and neck	18%
Leg	14%
Anterior trunk	18%
Posterior trunk	18%

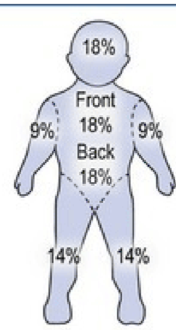

Figure 4.2 Calculation of paediatric burns.

Heterotopic calcification

- This is a complication occurring in late burn rehabilitation, most frequently in the elbow joint.
- The symptoms are an increased difficulty in performing exercises, with pain in the joint and more limited range of movement.
- An X-ray will show radio-opaque fluffy amorphous mass round the joint, although not until a few weeks after the patient begins complaining of pain in the joint.
- As the calcification can significantly limit the joint range of movement, it is important to continue active exercises and avoid long periods of immobilisation (e.g. with splints).
- Strong passive movements appear to be contraindicated, as they can cause more joint trauma.
- Surgical treatment may start with manipulation under anaesthetic, but eventually a more invasive procedure may be required to remove a bony block.

Reconstructive surgery

- Further surgery may be required for scar release and revision.
- This may involve synthetic skin substitutes such as Matriderm or Integra.

Goal setting

- Short- and long-term goal setting is important as it provides a patient clear directions to follow and provides motivation during their treatment programme.
- Small achievements will help the patient to maintain a patient's morale during what can be a very distressing and lengthy rehabilitation.

Record keeping

- Clear documentation of all the interventions is of prime importance.
- The 'Standards of Physiotherapy and Occupational Therapy in the Management of Burn Injured Adults and Children' is a document all therapists should read when involved in burns care (BASW 2005).

Plastic surgery

- Depending on the pathology and the type of surgery, patients that have received plastic surgery may stay a minimum of one or two nights on a ward.

- This will vary depending on the local postoperative protocols.
- In many instances patients with simple tendon and nerve repairs or fractures may be treated as a day case, rather than staying in hospital overnight.
- Some departments have clinics where the patient can be assessed by the doctor and then given advice by the therapist outlining what they should expect from the surgery and the postoperative intervention and treatment.
- Some departments provide patients with comprehensive leaflets which cover the same information.

Ward-based treatment

Respiratory management

- If a patient stays overnight on the ward, the minimum intervention would involve the patient receiving a day one chest check.
- This usually entails a check of the SaO_2 levels, the respiratory rate and auscultation of the patient's chest.
- If a patient is having difficulty taking deep breaths due to pain, physiotherapists are ideally placed to inform the doctors or nursing staff of this and to ensure the patient has adequate pain relief in order to ensure that the optimum conditions are available for the patient to expand their airways and prevent chest complications.
- Head and neck patients who have had a radical neck dissection or those undergoing an ENT procedure may have a tracheostomy in situ.
- Some patients may have spent a period of time on ITU following their surgery and they will have their own unique respiratory requirements due to an element of ITU deconditioning with or without tracheostomies in situ or following major head and neck reconstruction. This can include flaps inside the mouth and palate.
- Patients who have spent time on ITU may need encouragement to take deep breaths, and will require gentle and gradual activity pacing and progression so they do not become fatigued.
- This can occur after any time spent on ITU. Patients who require ITU input tend to be those with more extensive surgery and those who can be more unwell prior to surgery or less mobile, e.g. flaps related to gynaecological cancers follow a slower rehabilitation stream.

Mobility

- Early intervention from the physiotherapist providing a mobility assessment either pre- or post-operatively can provide the information that enables the team to discuss the plans for treatment relating to the mobility and function required by the patient.

- This also identifies any blocks or hurdles there may be to achieving a timely discharge home for a patient from the ward.
- There need to be good communication channels between all the support services and the medics, to ensure the patient is discharged to the appropriate place, whether this is to a community hospital, intermediate care bed or to the patient's home.

Bedrest

- Some patients may be on a period of enforced bed rest whilst in hospital, e.g. some departments may not allow patients to mobilise on day one following the establishment of a muscle flap.
- They may require a period of 'dangling' while the congestion of the flap is assessed over a period of 4–5 days with gradually increasing timescales from 30 seconds up to a period of five minutes.
- There should always be an awareness of the needs of the patient as a whole to ensure full range of movement (ROM) is being maintained in all non-affected joints, particularly in elderly patients and those with polytrauma where immobility may lead to increased joint and soft tissue stiffness.
- Bed exercises should be provided to maintain strength of muscles in the unaffected limbs. This will ensure that the patient will have sufficient power to enable them to mobilise safely with walking aids.
- Bed exercises will also have an effect on maintaining the flow of the circulation, preventing complications such as deep vein thrombosis and encouraging deep breathing as an exercise can help prevent chest infections or other complications as a result of the reduced airway expansion from enforced bed rest.
- Some departments encourage transfers into a chair before dangling commences, and it is important that the patient and nursing staff know how to do this safely and in a protected manner.
- Teaching the patient how to use a banana board or a rotation plate can facilitate early sitting out.
- How a patient mobilises will depend on the surgery undergone and other co-morbidities.
- Some equipment which you will be familiar with are pulpit frames, gutter frames, Zimmer frames, crutches, sticks and standing hoists.
- Any and all of these may be used on plastic surgery wards and the physiotherapist should familiarise themselves with each piece of equipment in order that the patient can be shown all the relevant health and safety checks relating to the equipment and its use.

Outpatients

Dressings

- Often the nursing staff will carry out wound dressings on the ward, and may take them down in clinic prior to you seeing a patient.
- Sometimes, however, the physiotherapist will be required to do the dressings.
- Be familiar with the departments' infection control protocol.
- Dressings should only be changed using an aseptic technique.
- Depending on what requires dressing, e.g. with hand surgery (tendon repairs and similar) the lighter the dressing is, the more likely it is that the patient will begin moving early and easily.
- If a dressing is very bulky, the patient will find it difficult to do their exercises and may well not bother. There are various factors to consider when deciding which dressings to apply (Table 4.4).

Table 4.4 Type of wound and choice of dressing

Type of wound	Dressing to use
Dry and clean. Suture in place	Non-stick Use something like 'Jelonet' covered with gauze or plaster
Oozing wound, but not open	Non-stick May need more gauze, held in place with bandage or tubinette
Open and oozing	Antiseptic dressing, like Inadine or a Betadine spray Covered with gauze and bandage to secure it

Splinting

- Following the application of dressings, the tendon repair or fracture should be protected to provide a safe environment for exercise and rehabilitation.
- There are many different splints which can be provided for patients. These can be pre-formed or made specifically for the patient.
- Splints are most commonly made out of thermoplastic for rigid splints, or neoprene for those which need to be less rigid, or which need to be less hard.
- Thermoplastic materials have a variety of different properties.
- Some can be very hard and rigid, but may also be quite bulky.
- Some are lightweight, but also can be very strong.
- Some are very easy to work with and they can be formed easily, but they may have a very short working time.
- Some thermoplastic can be so malleable that it can feel like a piece of chewing gum. Having a very malleable material can be difficult to form into the shape required, but it

often drapes well to give a better conformity.

- Depending on what the splint is required to do will dictate which type of material is used for its construction.
- Every department has slightly different protocols relating to splinting, the length of time patients should wear them, and what types of exercises can be carried out whilst the patient is wearing the splint.
- Figures 4.3-4.6 illustrate examples of some of the more commonly used splints for protecting tendon repairs.
- The splints illustrated in Figures 4.3-4.6 have been made out of Ezeform thermoplastic and are fastened with Velcro straps.
- Splints are not always the rigid, static structures that are used to prevent movement as illustrated in Figures 4.3-4.6.
- They can be made with a hinge incorporated into the slab, or with elastic structures that facilitate movement and are generally known as dynamic splints (Figures 4.7 and 4.8).
- Dynamic splints are used to help with digit and wrist extension, e.g. following a radial nerve palsy.
- A dynamic splint may improve a patient's functional ability, i.e. if a patient is able to flex the digits, but is unable to use the hand functionally due to their inability to extend the wrist and extend their fingers, then a dynamic splint can assist the wrist and fingers to be moved into extension to enable the patient to be able to grip objects with the finger flexors.
- A dynamic splint is used primarily to restore function to the patient, although they do have to have a fairly high level of compliance in order to wear the splint and achieve meaningful function.
- The patient may need a splint to restrict movement in one area in order to facilitate another joint to increase its functional range.
- Sometimes a joint needs to be supported if it is hypermobile, for example. This will encourage muscles to work more effectively, within an optimum range and length to increase the stability of the joint.

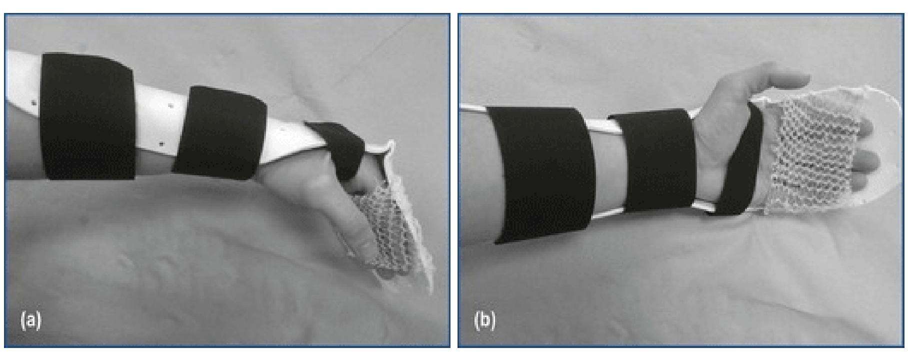

Figure 4.3 (a and b) Flexor hood for tendon treatment.

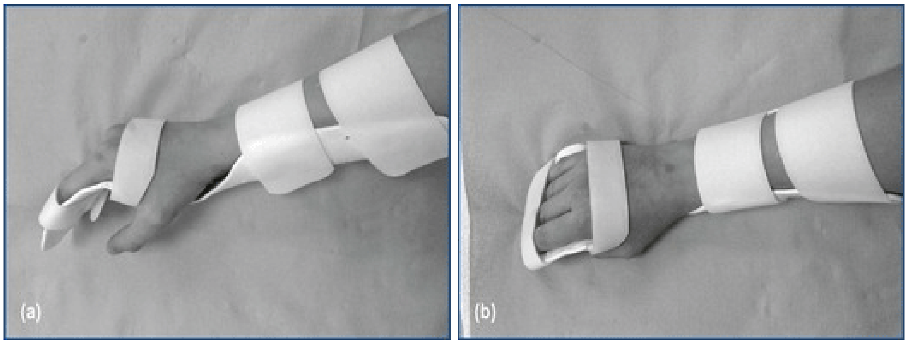

Figure 4.4 (a and b) Splint used for extensor tendon repair of the digits.

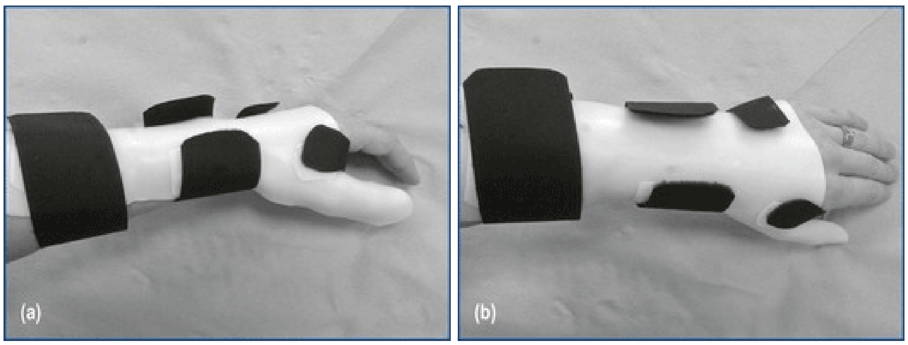

Figure 4.5 (a and b) Splint used for flexor tendon repairs of the thumb.

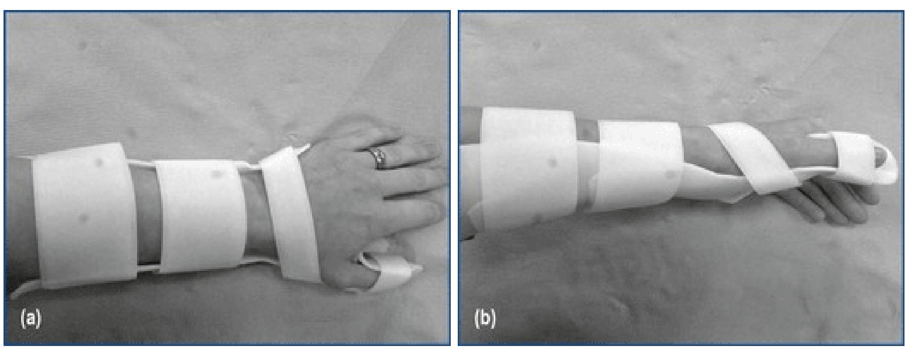

Figure 4.6 (a and b) Splint used to protect extensor tendon repairs of the thumb.

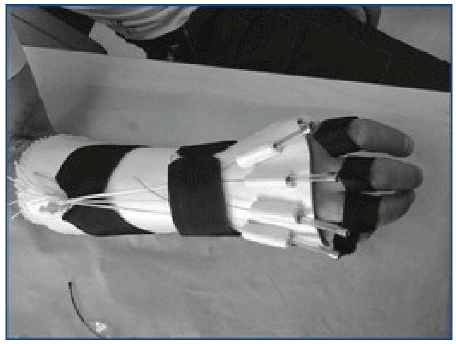

Figure 4.7 Dynamic splint.

Figure 4.8 Dynamic splint.

Scarring

- Whenever there is a wound to the skin or soft tissue structures, there will always be the deposition of scar tissue. The treatment of this has been covered in detail in the burns section.

Heightened sensitivity/decreased sensation

- A scar can become sensitive during the course of remodeling.
- If a nerve has been damaged this can lead to sensitivity of the area or altered sensation in the part of the limb supplied by that nerve.
- When this sensation is increased it is called peripheral sensitisation.
- Central sensitisation can be experienced by people with complex regional pain syndrome.

Touch

- A variety of different textures and different pressures are required to stimulate nerve recovery.
- If there is heightened sensation the patient can start with exposure of the area to a texture

or level of pressure which is uncomfortable, but not painful.

- After a short period of approximately 1–2 minutes, they progress to a texture or level of pressure which is comfortable.
- After a further 2–3 minutes they return to the original texture or pressure.
- The patient should find that the discomfort has eased and they should be able to tolerate the texture or pressure more easily.
- This reduction in sensitivity is due to there being a reduction in the nerve firing threshold and in the number of signals being sent to the brain.
- The brain does not continue to process the signals as pain and the discomfort level is simultaneously reduced.
- If the patient is encouraged to look at the painful area as they are touching it, this helps to stimulate visual input into the somatosensory cortex.
- This reduces cortical reorganisation and encourages neural regeneration (Svens & Rosén 2009).
- Touch through massage over an area of altered sensation or a painful scar can stimulate blood flow, which in turn improves the interstitial fluid balance. This has the effect of removing any potentially harmful inflammation away from the tissues and from around nerve endings.
- If the inflammation is left it can become a source of peripheral sensitisation as it will become a stimulus for nociceptive fibres which can lead to the perception of pain.

Tapping

- Tapping is a form of touch, which is a more specific way to stimulate the deep pressure and vibration sensory nerve fibres found in the dermis, e.g. Merkel receptors and Pacinian corpuscles.
- The vibration sense is often the first area of ‘nerve feeling’ to return.

Visualisation

- This involves hiding the hand or affected area and imagining the movement as if it is actually being performed. This is a strategy during the later stages of nerve recovery (Butler & Moseley 2003).
- Mirror therapy is another useful technique.

Oedema

- Along with altered sensation oedema may be present.
- The pressure caused by oedema can alter nerve conduction, which leads to an alteration in the blood flow to the affected area, which in turn can increase the interstitial fluid.
- Other causes of inflammation and oedema could be infection, CRPS, overuse or underuse

of the affected area.

- In the first stages of wound healing and inflammation, oedema is required as a necessary part of the healing process.
- However, if this state continues for longer than 2–3 weeks, it can become problematic.
- Long-term oedema can lead to stiffness in the hand and contractures of the soft tissues.
- It can prevent free gliding of the tendons and nerves through their interfaces and it can affect circulation, which subsequently has an impact on nerve healing and on skin condition.
- Oedema can be managed by using pressure garments, similar in design to those used in burns management which can be either made-to-measure or of-the-shelf garments.
- As with burns they ideally need to be worn for 23/24 hours a day to gain the most benefit.
- Massage can be used to help to improve circulation and to help to move the swelling out of the affected areas and into the lymph system.
- Warming an oedematous area both prior to and after massage can improve the circulation further.
- Using a piece of equipment called a 'chip-bag' can assist in moving stubborn oedema, particularly from the dorsum of the hand or arm.
- This consists of lots of small pieces of foam or neoprene chips inside a cloth bag. This is placed over the affected area and held into place with a bandage to create compression.
- It should be removed and repositioned periodically when it is worn to ensure the 'chips' create different areas of pressure over the oedematous part of the body.

Loss of range of movement

- Swelling or oedema can lead to a loss of range of motion.
- Other causes include fractures, altered tissue length leading to contractures around joints, a lag in movement where the soft tissues are too 'baggy' to contract fully and nerve damage resulting in reduced motor nerve signals getting to the muscles.
- Treatment modalities will be dependent on the cause of the loss of movement.

Fractures

- These could lead to a loss of range of motion due to pain, or because the area feels unstable or vulnerable to movement. Before you can work on soft tissue changes the skeletal system has to be strong enough to support movement. This would commonly be fixed through surgical means if required, but as therapists we can help with splints or braces to support the skeletal system whilst allowing some movement. Movement at a fracture site can help to stimulate bone regrowth so long as the fracture edges are close enough together to promote healing.
- Refer to Chapter 17 for further detail.

Contractures

- These can be caused by tight, stiff tissues restricting the amount of movement available at a joint, or due to scar tissue preventing movement from being retained.
- If the contractures are due to scar tissue, the patient should be encouraged to undergo deep tissue massage of the scar and close surrounding area.
- Splinting of the area, particularly in the hand will allow the tissues to stretch.
- If you apply the physics of tissue lengthening to contractures, tissue creep, where the tissues are placed under a low load for extended periods of time slowly lengthens the tissues without causing pain (Flowers and LaStayo 1994; Jordan et al 2000).
- Ideally the splints should be worn for at least 12 hours of the day/night, but the best results are obtained if the splints can be worn for longer than this (Glasgow et al 2003).
- Making static progressive splints where the tension of the stretch can be increased gradually by the patient allows the elasticity of the tissues to return without a high demand on the therapy services.
- Static progressive splints can be made to improve both flexion (Figure 4.3a) and extension of a digit or digits, but you have to make sure that the patient understands that the splint application should almost feel like nothing is happening to the tissues (i.e. very low load of stretch) as otherwise when worn for extended periods of time it becomes painful.
- The patient is unlikely to comply with the splinting for the time required to achieve a result if it is painful.

Lengthened tissue

- Splinting can also be used to help to shorten tissues where they have lengthened. This can happen after a fracture when the bone has lost height. By splinting the tissues in a shortened position it can help to tighten the structure.

Nerve damage

- The level or type of nerve injury will affect the functional deficit and changes to the ROM (Table 4.5).
- The higher the nerve damage (the more proximal to the spinal cord) the more extensive the functional input. The more damaged the nerve the more likely there will be functional deficit.
- This can be treated through sensory re-education and also the use of splinting to provide a functional position of joints.
- Examples are the foot drop splint, which is used when there has been damage to the common peroneal nerve of the leg, which results in the inability to dorsiflex the foot and toes (Figure 4.9). Another is the dynamic splint as seen earlier in the chapter which can

be used for radial nerve injury in the upper limb (Figure 4.10).

- Splinting should also be used for positioning the affected limb to prevent the development of contractures as the nerve recovers.
- Surgery may be required to create a more functional limb; for example muscle transfers or nerve grafting in the longer term after injury.

Table 4.5 Nerve injuries (Seddon 1943)

Type of nerve injury	**Definition**
Neuropraxia	Compression, or generalised bruising to a nerve. Segmental demyelinisation
Axonotmesis	Damage to the axonal layer of the nerve. Slow recovery. Wallerian degeneration below level of damage
Neurotmesis	Damage to the internal structure of the nerve. Complete loss of continuity with Wallerian degeneration below the level of the injury. Requires surgery to recover
Avulsion	Complete rupture of the nerve at the root. Often non-salvageable even with surgery

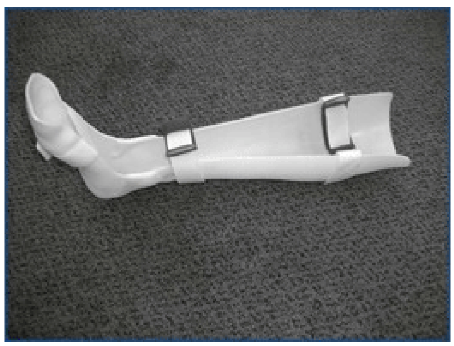

Figure 4.9 Foot drop splint.

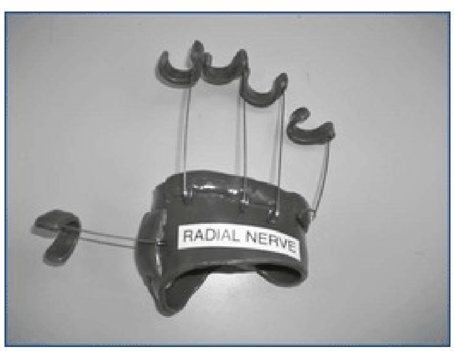

Figure 4.10 Dynamic splint for radial nerve injury.

Pain and complex regional pain syndrome (CRPS)

- Pain is one of the features of complex regional pain syndrome (CRPS) and can be very disruptive for normal movement and for therapists trying to encourage movement or a return to function.
- Movement may stimulate and increase the pain sensation. It is described by the IASP (International Association for the Study of Pain) as being:

  ...an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.

- Note that it talks about 'actual or potential' damage to the tissues. If the brain perceives something to be a threat, we as therapists have to educate the patient to understand which pain behaviours are useful for recovery and those which can become ingrained and dysfunctional.
- Nociceptive pain can be treated using regular analgesia, heat or ice therapy, massage, ROM and stretches.
- Neuropathic pain, described as 'burning, hot, deep bone type pain' has elements of peripheral and central sensitisation and should be managed using a multi-modal approach (Svens and Rosén 2009).
- Peripheral sensitisation is common in CRPS presentations and should it become chronic then central changes can occur.
- Other symptoms of CRPS are stiffness, allodynia or hyperaesthesia, changes to hair and nail growth (either increased or decreased), changes to sweating and temperature of the hand, changes to the condition of the skin and altered ROMA patient with CRPS may have all, or only some of these characteristics, and they do not necessarily follow a timeline.
- Sometimes they can occur weeks or months after the initial trauma to the body.
- This therefore makes it very difficult to predict, and the treatment should be designed to fit the current symptoms.

A multimodal approach to treatment

- The sensorimotor cortex of the brain is made up of links to many different parts of the brain which include sight, sound, smell and hearing.
- Treatment of CRPS and pain has to use elements of all of these senses.
- Simple pain relief, such as paracetamol or anti-inflammatories plays a part in the treatment of CRPS.
- When we ask them to give a painful area more attention, it can make the pain worse initially, so we need that 'window of opportunity'

Analgesia

- Most common medications used are amitriptyline (below 50 mg), which is taken at night. It should be taken regularly and does not work effectively if taken 'as and when'.
- Another form of medication is gabapentin or pregabalin (Lyrica).

Education

- This is the most important aspect of treating CRPS.
- The patient must be reassured that the development of CRPS is not their fault.
- Some people develop it and others do not and we have a limited idea as to why.
- Education around pain behaviours and pain responses will help the patient to see that even though the exercises are painful, it is not causing actual tissue damage.

Desensitisation

- This type of treatment can be used to incorporate the multimodal approach.
- When the patient touches the different textures, you can also use textures which have smell, such as citrus peel; sound, such as crinkly sweet wrappers, or rough Velcro; and vision, by looking at which body part is being touched, when it is being touched.

Hand laterality tasks

- This uses vision to start recognition of the affected limb, whether it is hand, foot or other body part, in different positions.
- Moseley (2005) found that this was useful in reducing pain and disability in his patient group with CRPS of the hand.
- Using flash cards with limbs in different positions over time by patients can help to reduce pain.
- The cards are mixed together and picked out at random and the patient has to state whether they are a right or a left limb.

Graded imagery

- This is related to the visualisation tasks as described in the nerve injury section.
- The patient should first start with the laterality tasks, and then imagine their own hand or leg in the positions on the cards.
- Once this is comfortable and does not cause them pain they should then start to place their own affected hand or limb into the positions seen, using only the cards related to their affected side.

Mirror therapy

- Mirror therapy was described as a useful tool for treating phantom limb pain by Ramachandram and Hirstein (1998), and its use in other areas of pain associated with cortical reorganisation has been steadily gaining ground.
- Due to the homunculus and the brain itself being open to plasticity and change, mirror therapy is a way of harnessing this change for positive recovery.
- The patient is set up with their good limb visible in the mirror, devoid of any distinguishing features such as rings, watches or socks.
- The affected limb is placed behind the mirror screen so the patient looks at the non-affected limb in the mirror.
- By moving the non-affected limb, and seeing the reflection in the mirror, the brain 'recognises' that the affected limb is moving, and pain can reduce as a result.
- Mirror therapy should be used by the patient daily and should be repeated 5–6 times per day for 5–10 minutes each time to get the best result from the treatment modality (Grünert-Plüss et al 2008).
- Ideally it should be done under supervision the first time, to ensure the patient's pain levels do not increase on the affected side. Should this happen the treatment should be stopped, and the patient returned to laterality or graded imagery (Moseley 2005).

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Additional resources

www.bapras.org.uk

www.breastcancercare.org.uk

www.britishburnassociation.org

www.cancerbackup.org.uk

www.cancerhelp.org.uk

www.changingfaces.org.uk

www.dansfundforburns.org

www.microsurgeon.org

www.plasticsurgery.org

All websites accessed 27 July 2011.

Chapter 4

E-materials

Author profiles

Clara Upson BSc(Hons) MCSP

Clara is an advanced physiotherapist working at Stoke Mandeville hospital in Aylesbury. Clara has ten years experience specialising in burns and plastics physiotherapy and she is a member of the BBA and also a regular attendee of the UK burns therapy network meetings.

Anne Alexander MSc BSc(Hons) MCSP MMACP

Anne has worked in Hand Therapy (plastics and orthopaedics) since 2003. She has been the Team Leader and Clinical Specialist in the Hands and Plastics Department of the John Radcliffe Hospital since 2007, following her MSc in Advanced Physiotherapy from UCL, London.

Anne manages an acute plastic surgery inpatient ward and a busy hand therapy and upper limb outpatient department, whilst providing specialist cover (along with her team) to other departments within the hospital and the surrounding areas.

Jane Leathwood Grad DipPhys MCSP

Jane qualified from Addenbrookes School of Physiotherapy in 1992. After completing her junior rotations she worked in the musculo-skeletal field until the opportunity arose to join the Plastic Surgery team at St Thomas' Hospital, London. Here she discovered her niche, and led the team, first as a Band 7 (Senior), then as a Band 8a (Superintendent). However, she eventually decided her managerial duties were taking her away from her clinical caseload for too much time, so moved to the Burns and Plastics unit at Stoke Mandeville Hospital, Aylesbury in 2004.

She is a member of the British Association of Hand Therapists (BAHT), has achieved her BAHT Level 2 accreditation as a hand therapist, and given a poster presentation at the Annual Conference. She is also a member of the British Burns Association, and attends study days in Burns and Plastics whenever possible. Along with Clara Upson, her co-author, she also enjoys the challenges of teaching all levels of the multi-disciplinary team in both specialities.

Acknowledgements

Maria Clarke, Nicola Hyde and Joy Baria.

Appendix 4.1 Dressings

Superficial burns		
Dressings	Classification	How it works
Bactigras	Antimicrobial agent/low-adherent dressings	Used for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Siltex	Non-adherent dressing	Soft silicone used as primary wound dressing
Flamazine	Antimicrobial cream (contains silver sulfadiazine1%)	Prevention and treatment of wound infections at the site of burns
Glucan Pro Creams	Moisturising cream	Aid to skin recovery, assist pain management, moisture retention and itch relief
Inadine	Antimicrobial agent/low-adherent dressing	Indicated for prophylaxis and treatment of infection
DuoDERM	Hydrocolloid, semipermeable dressing	Used in the treatment of lightly exuding burn wound. Produced moist conditions under the dressings that promote epithelialisation without causing maceration
Trimovate	Steroid, antibiotic and antifungal	Helps reduce swelling and irritation. Fights certain bacterial and fungal infections of the skin
Allevyn	Adherent/foam dressing	Used for moderate to highly exuding wound
Betadine	Antiseptic solution (10% water)	Used to prevent wound infection
Partial-thickness burns		
Dressings	Classifications	How it works
Flamazine	Antimicrobial cream (contains silver sulfadiazine1%)	Prevention and treatment of wound infections at the site of burns
Flammacerium	Antimicrobial cream (unlicensed medicine)	Prevention and treatment of infections of severe burns. Promotes rapid formation of eschar which provides mechanical protection for the healing wound
Trimovate	Steroid, antibiotic and antifungal	Helps reduce swelling and irritation. Fights certain bacterial and fungal infections of the skin

Granugel	Hydrocolloid gel	Creates moist healing environment, helps to promote natural autolytic process of debridement
Inadine	Antimicrobial agent/low-adherent dressing	Indicated for prophylaxis and treatment of infection
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Acticoat	Antimicrobial barrier/low-adherent (silver coated)	Exhibits pronounced antibacterial activity against wide range of Gram-positive and Gram-negative bacteria and also effective against strains of yeasts and fungi
Biobrane	Adherent/semipermeable biosynthetic silicone dressing (derived from pigs)	Controls water vapour loss and provides a flexible adherent covering for the wound surface allowing joint movement and early ambulation and minimises the proliferation of bacteria on the wound surface by minimising dead space
E Z Derm	Biosynthetic wound dressing	Acts as temporary protective wound barrier that allows natural healing process to continue undisturbed
Tegapore	Low-adherence dressing	Allows the passage of exudates from the wound to a secondary absorbent dressing of choice
Full-thickness burns		
Dressings	Classification	How it works
Bactigras	Antimicrobial agent/low-adherent dressings	Used as a primary wound dressing for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Siltex	Non-adherent dressing	Soft silicone used as primary wound dressing
Flamazine	Antimicrobial cream (contains silver sulfadiazine1%)	Prevention and treatment of wound infections at the site of burns
Flammacerium	Antimicrobial cream (unlicensed medicine)	Prevention and treatment of infections of severe burns. Promotes rapid formation of eschar which provides mechanical protection for the healing wound
Granugel	Hydrocolloid gel	Creates moist healing environment, helps to promote natural autolytic process of debridement

Tegapore	Low-adherence dressing	Allows the passage of exudates from the wound to a secondary absorbent dressing of choice
Skin graft		
Dressings	Classification	How it works
Tegapore	Low-adherence dressing	Allows the passage of exudates from the wound to a secondary absorbent dressing of choice
Bactigras	Antimicrobial agent/low-adherent dressings	Used as a primary wound dressing for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Acticoat	Antimicrobial barrier/low-adherent (silver coated)	Exhibits pronounced antibacterial activity against wide range of Gram-positive and Gram-negative bacteria and also effective against strains of yeasts and fungi
Betadine	Antiseptic solution (10% water)	Used to prevent wound infection
Tegapore	Low-adherence dressing	Primary wound dressing. Allow the passage of exudates from the wound to a secondary absorbent dressing of choice
Bactigras	Antimicrobial agent/low-adherent dressings	Used as a primary wound dressing for the prevention of infection (wide range of Gram-positive/Gram-negative bacteria)
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue
Non-invasive scar management		
Dressings	Classification	How it works
Dermatix	Topical silicone gel	Effectively treats and reduces scarring. It is clinically tested and proven to soften, flatten and smoothe scars, relieving the itching and discomfort
Mepiform	Self-adhesive soft silicone dressing (waterproof dressing)	Designed for the management of both old and new hypertrophic and keloid scars. Facilitates application and retention of the dressing to intact skin, but does not cause epidermal stripping or pain on removal
Burns reconstruction + negative-pressure therapy (Vac/Vista therapy)		
Dressings	Classification	How it works
Mepitel	Non-adherent to low-adherent dressing	Soft silicone used as primary wound dressing. Easy to remove with minimum pain and without damaging delicate new tissue

Duoderm	Hydrocolloid, semipermeable dressing	Used as a primary dressing applied to the surrounding wound surface to protect skin from maceration during therapy
Opsite	Semipermeable film adhesive dressing	Provides a sealed environment to the dressing during negative-pressure therapy
Matriderm	Collagen elastin matrix for dermal regeneration (obtained from bovine dermis)	A dermal substitute to improve the quality of the reconstructed skin, to reduce scarring and prevent wound contraction
Integra	Single layer/bilayer membrane system used a template for dermal regeneration	Facilitates formation of dermis and upon vascularisation, skin graft (epidermis) is placed over. Cells grow and form a mature epidermis thereby closing the wound and resulting in a functional dermis and epidermis

Joy Baria, Burns Nurse SMH September, 2010.

Case Study 4.1

Background

- A 28-year-old, male, works as a hospital porter.
- Non-smoker. Lives with wife.
- Physically well prior to the injury.
- Right-handed.
- Hobbies include gym, football.

HPC

- The injury was sustained when his clothes ignited from a bonfire.
- The flames were extinguished by a neighbour.
- The patient presented to A&E with burns to his chest, abdomen, both upper limbs and hands.
- No other first aid as administered and he was taken by ambulance to the A&E department of the nearest hospital with a burns unit.

Objective assessment on admission to the burns unit

- No additional injuries were found.
- GCS 15/15.

- Burns were assessed as 40% TBSA full-thickness burns and documented using a Lund Browder chart.
- Circumferential burns to both upper limbs required fasciotomies.
- Patient was commenced on fluid resuscitation and a NG feed.

PMH

Nil

DH

Nil

Surgical management

- Day 1 – Debridement and SSG to burns on both upper limbs and hands.
- Postoperatively hands were splinted in a position of safe immobilisation (POSI) and both upper limbs were protected with thick bulky dressings with elbows in a position of extension to limit movement of grafts.
- Day 3 – Debridement and SSG to burns on chest and abdomen.
- Postoperative bulky dressings to chest and back.
- Donor skin was taken from both lower limbs and back.

Identified goals and treatment plan – acute stage

Initial problems

- At risk of loss of range of motion of shoulders, elbows, wrists and hands due to skin grafting.
- General weakness and loss of muscle strength.
- Bulky dressings on arms, hands, chest and abdomen.
- Goals to maintain full passive ROM of upper and lower limbs and to initiate early mobility.
- Pain on certain movements.

Acute stage treatment (inpatient)

- The patient was well motivated and understood the importance of the goals set and the need to maintain joint ROM post grafting.

- On day 2 he was able to transfer from bed to chair with assistance of 2.
- Daily passive movements to upper limbs and hands were commenced once grafts were checked at 5 days postoperative and doctors were happy with graft take.
- Exercises were initially performed with dressings down and under direct vision to prevent damage to fragile grafts.
- The physiotherapists liaised with nursing staff regarding change of dressings and timing of his analgesia, and with the OTs, who fabricated thermoplastic night splints for his hands to continue to maintain a resting safe position.

Intermediate rehabilitation (inpatient)

- Lower limb strengthening with and without weights.
- Transfer practice and independent mobility.
- Hand functional assessment.

Goals set

- Lower limb muscle strength 4/5 by D/C.
- Independent with all transfers.
- Independent mobilising and completed stair assessment by D/C.
- Full active ROM of all joints affected.
- Full independent function.
- Psychological assessment.

Later stage treatment (outpatient)

- Pressure garments to keep the scars flat and pliable.
- Moisturising cream and massage to maintain elasticity to the skin.
- Protection from sunlight to reduce hyperpigmentation and sunburn.
- Silicone gel to soften and help scar flattening.
- Management of itching with creams, massage and cooling.
- Splintage – static elbow night splints to maintain elbow extension.
- ROM exercises and stretches to maintain joint ROM and limit contractures.
- Muscle strengthening.

Outcome

- By week 3 the patient was discharged home.
- He was independent in all functional tasks, and independently mobile.
- He was motivated to continue a vigorous home exercise programme and continued physiotherapy as an outpatient.
- He has a scar contracture of his right axilla that limits full shoulder movement and will

require surgical release.

Case Study 4.2

Background

- A 40-year-old man.
- Lives with his wife.
- IT worker.
- Non-smoker.

Presentation in A&E

- Patient was admitted following a house fire.
- The patient was covered in soot.
- He had soot in his sputum and singed nasal hairs.
- He had sustained burns to his face, upper and lower limbs, TBSA 30%, mostly full thickness, this was documented on a Lund Browder chart.
- The patient was assessed in A&E and intubated due to the clinical signs of an inhalation injury.
- Fluid resuscitation was commenced and he was transferred to ITU.

Day 2 on ITU

- A bronchoscopy was performed to clear sticky sooty secretions, which were continuing to be a problem.

Observations

CVS – stable BP of 112/65, pulse 106, in sinus rhythm. CVP 10.
Resp – Ventilated on SIMV, Intubated with size 8 ETT, RR 16, FiO2 0.5 TV 620ABG's see below.
Renal – steady urine output.
Neuro – level of consciousness 'V' on AVPU.
Symptoms – wheeze, cough on suction, sooty and purulent sputum.

PMH

- Nil of note – normally fit and well.

Current medication

- He was sedated on Propofol.
- Morphine infusion for analgesia.
- Nebulised Ventolin.
- NG feed.

Investigations

- ECG: some arrhythmias.
- COHb: indicates high exposure to CO.
- Cardiac enzymes: increased due to widespread muscle damage.
- Electrolytes: hypokalaemia.

Arterial blood gases

- On admission:
  - pH = 7.24
  - $PaCO_2$ = 2.60 kPa
  - PaO_2 = 11.2 kPa
  - HCO_3 = 7.8
  - BE = −16.4
  - SaO_2 = 93%
  - COHb = 20%
  - FiO_2 = 0.60.
- On day 2:
  - pH = 7.22
  - $PaCO_2$ = 5.35 Pa
  - PaO_2 = 10.1 kPa
  - HCO_3 = 20.2
  - BE = −4.6
  - SaO_2 = 93%
  - FiO_2 = 0.5.
- Implications of blood gases
  - Day 1 – metabolic acidosis.
  - Day 2 – metabolic acidosis with a respiratory component.
- The chest X-ray showed right lower lobe collapse and/or consolidation.

At the bedside

Observations

- The patient was lying supine, he was sedated and ventilated.
- His respiratory rate was 16.
- Chest expansion was noted to be equal on palpation.
- He had dressings round his arms and legs.

Auscultation

- There were reduced breath sounds at both bases with a marked expiratory wheeze.

Main problems

- Carbon monoxide poisoning.
- Hypovolaemia.

Physiotherapy problems

- Smoke inhalation injury, leading to:
  - Sputum retention
  - Marked brittle airways resulting in bronchoconstriction
  - Burns to face, back and limbs.

Aims of acute treatment

- Reduce sputum retention.
- Improve air entry and ensure adequate ventilation.
- Maintenance of limb movements whilst sedated.
- Prevention of ARDS.

Early treatment

- MDT communication and goal setting were documented in line with the burns standards.
- Positioning to improve right lower lobe consolidation, avoiding head-down tilt because of facial burns and oedema.
- Gentle suction to clear thick sooty secretions, avoiding further airway trauma.
- Manual techniques including vibrations or percussion, as no burns over the chest.
- Manual hyperinflation providing using normal precautions.
- Installation of saline.
- Ensure treatment is coordinated with bronchodilators.
- Timing of treatment with adequate analgesia.

- Humidified oxygen.
- Development of thick green secretions indicating pneumonia, requiring prescribed antibiotics.
- Sputum samples ensure appropriate antibiotics are prescribed.

Musculoskeletal

- Passive movements and splinting required to maintain ROM of affected joints and prevent contractures (uppers limbs, lower limbs and face).
- Progression to active assisted and active joint range as able.
- Oedema around burns sites, requiring elevation of upper limbs and face.

Further treatment

Respiratory

- Further bronchoscopy to clear the sticky secretions.
- Progression to CPAP once the patient is stable.

Surgical management

- The burns were mainly full thickness and sooty requiring surgical debridement and grafting, therefore multiple surgery and anaesthetics.

Musculoskeletal

- Progression of ROM exercises and strengthening.
- Assessment of transfers and mobility was carried out once the patient was more stable and weaned off the ventilator.

Psychological issues

- Were addressed with a psychology assessment.

Outcome

- The patient spent four weeks on ITU and then was transferred to the burns unit.
- With ongoing treatment he has returned to pre-injury level of function and returned to work.
- The case study highlights the importance of early physiotherapy interventions for respiratory care whilst patients are ventilated on ITU.

Case Study 4.3

Background

- 30-year-old female, right-handed.
- Smokes 20/day.
- Lives with partner and young daughter.
- Unemployed at present, partner works.
- Hobbies include gardening.

HPC

- Admitted to specialist surgery ward via ED following attempted suicide cut to volar left wrist.

PMH

- Depression.
- Nil else of note.

DH

- Venlafaxine – antidepressant.
- Amitriptyline.
- Sleeping tablets.
- Nil else of note.

Surgical management

- Went to surgery 5 days post injury.
- Had a repair of:
  - 90% division ulnar nerve
  - 50% division median nerve
  - 100% division FCU
  - 75% division FCR
  - 100% division FDP all fingers
  - 100% division FDS all fingers.
- Wound closed with dissolvable sutures.
- Placed into dorsal hood made from POP and bulky dressing.

- Advised to touch fingers and move as able within the dressings.

Initial problems at first assessment (2 days post surgery)

- Patient still on ward as requiring high level of psychiatric input.
- Pain in the hand and fingers.
- Loss of protective sensation due to nerve damage.
- At risk of contractures to webspace (due to median nerve being affected and APB weakness) and to fingers (loss of lumbricals due to ulnar nerve damage; and extensive tendon damage).
- Very dry skin with some loss of tactile gnosis to fingertips of ring and little fingers.
- Issues with wound healing due to smoking, and nerve damage.

Initial assessment and treatment

- Physiotherapists removed bulky dressing and POP, protecting the tendon and nerve repairs.
- Cleaned wound using aseptic technique and redressed with light dressing.
- Thermoplastic dorsal hood made from Ezeform TP.
- Advice and explanation given (with sheet) to wear splint continuously 24/24 hours and how to care for splint.
- Advice given regarding skin care – moisturising and protecting from cold/heat.
- Early active movement exercises given (with sheet). To do 3× every 2 hours.
- Sensory re-education retaught (sheet given).
- Education and reassurance given regarding nerve and tendon healing, what she can expect in the next few weeks, and overall prognosis.
- Loss of sensation to ½ middle finger, ring and little fingers. Pins and needles to the thumb.
- Full passive flexion all digits into palm.
- Lacks extension in ring and little fingers due to pain.
- Has good isolated glide of FDS and FDP to all digits.
- APB and lumbricals present.

Second treatment (1 week later)

- Started on Gabapentin yesterday due to increase in burning, shooting pains to hand.
- Splint rubbing ulnar border of hand – adjusted.
- Full extension all digits to splint.
- Full active flexion, tips to palm.

- APB present but weaker than previously.
- Added scar massage with cream to scar site – sutures dissolvable.

Goals set

- To maintain and improve ROM.
- To continue with sensory re-education and desensitisation exercises to enhance nerve recovery.
- Return to full function, even if this does not equal full ROM.
- Reduce smoking.

Later stage treatment

- Once out of splint (6/52), started light ADLs, gradually progressing to full ADLs at 12/52.
- Lost extension in the ring and little fingers due to clawing position of MCPJs – related to loss of lumbricals following ulnar nerve injury.
- Night extension splint made for ring and little finger.
- Anti-claw splint made for wearing in the day.
- Continued advice to protect fingers – occasionally burns the ring and little fingers.
- Continue with sensory re-education and fine dexterity tasks – drops small objects as cannot feel them.

Outcomes

- Lacking 20° extension at ring finger PIPJ, but not wearing anticlaw splint and this does not affect her function.
- Grip right side 30 kg, left side 20 kg.
- Still loss of protective sensation to ring and little fingers, patient adapting so not affecting function and no longer injuring the hand.
- Returned to voluntary work in garden centre – involves potting plants and moving heavy items.

Chapter 4 Burns and plastics: multiple choice questions

1. What is one of the signs of an inhalation injury?
   a). Persistent cough
   b). Green sputum
   c). Soot round nostrils
   d). Cherry red lips
2. Which of the following is not a sign of burns shock?
   a). Hypotension

b). Tachycardia
c). Rapid respiratory rate
d). Warm distal extremities

3. In what position should a patient with facial oedema be nursed?
   a). Sitting upright
   b). Supine with head elevated
   c). Side lying
   d). Tilted slightly down
4. Which treatment is contraindicated in the presence of a split skin graft on the anterior chest?
   a). Suction
   b). IPPB
   c). Passive movements of the upper limbs
   d). Vibrations
5. What may be a late complication of burns round the elbow joint?
   a). Osteoarthritis
   b). Osteoporosis
   c). Heterotopic calcification
   d). Tendon rupture
6. Which is least likely to be part of the emergency management of a patient admitted with a major burn?
   a). Fluid resuscitation
   b). Escharotomy
   c). Pain relief
   d). Mobilisation
7. In the first few days after skin grafting, affected joints should normally:
   a). Be vigorously exercised
   b). Have daily dressing changes
   c). Have a gentle exercise programme
   d). Be rested in a 'safe' position
8. Without exercises and stretches a full-thickness burn to the dorsum of the hand is most likely to result in:
   a). A flexion contracture
   b). Loss of wrist flexion
   c). Loss of passive extension of fingers
   d). Difficulties with composite flexion
9. What treatment can help to cosmetically improve hypertrophic scars in the burns patient?
   a). Heat
   b). Pressure therapy
   c). Ice
   d). Rest

10. What should a burns patient be encouraged to do after discharge from hospital?
   a). Rest
   b). Return to work immediately
   c). Continue a vigorous home exercise programme
   d). Wearing splints continuously
11. When would a patient ideally see a therapist following a tendon repair?
   a). After 2 weeks
   b). 5–10 days
   c). 1–5 days
   d). 10–15 days
12. The position of safe immobilisation protects the:
   a). Bones
   b). Ligaments
   c). Tendons
   d). Feet
13. If there is more dermis in a skin graft it means there will be:
   a). More contractures
   b). Fewer contractures
   c). No effect
   d). More laxity in the skin
14. A radial forearm flap is commonly used to treat the:
   a). Legs
   b). Feet
   c). Mouth
   d). Eyes
15. Dressings on hand wounds should be:
   a). Bulky
   b). Non-existent
   c). Light
   d). Tight
16. Splints are created:
   a). To be taken off whenever the patient thinks they should
   b). To provide a safe environment for exercise and rehabilitation
   c). To stop patients from exercising
   d). To stretch early tendon repairs
17. Dynamic splints:
   a). Have moving parts
   b). Should never be used
   c). Are very soft and malleable
   d). Are rigid
18. Early touch of the affected area after a nerve injury:
   a). Increases cortical reorganisation

b). Does not affect the brain
c). Is too painful for patients ever to tolerate it
d). Decreases cortical reorganisation

19. When treating CRPS you should always:
    a). Only use one treatment modality
    b). Never treat it
    c). Use a multi-modal treatment approach
    d). Only treat using one modality at a time
20. Mirror therapy:
    a). Works due to brain plasticity
    b). Does not work at all
    c). Constantly increases pain
    d). Works on everybody

Burns and plastics multiple choice answers

1. c)
2. d)
3. b)
4. d)
5. c)
6. d)
7. d)
8. d)
9. b)
10. c)
11. c)
12. b)
13. a)
14. c)
15. c)
16. b)
17. a)
18. d)
19. c)
20. a)

Chapter 5

Community Paediatrics

The development of the child

- A physiotherapist working in paediatrics should have an awareness of the stages that infants and young children progress through during their development.
- The physiotherapist may identify issues associated with motor function or the presence of a visual or hearing impediment.
- The physiotherapist should also be aware of the levels of development achieved by children and what would normally be expected in order to assist the planning of treatment interventions.

Locomotor development development

- The development of a child will include their ability to move independently, use their hands and to be able to interact with their environment through the use of their senses of vision, hearing and cognition.
- Most children follow a regular pathway of development, during which the different stages may be reached at different times.
- The presence of impairments such as vision or hearing or premature birth may lead to delay in or even failure to achieve certain developmental milestones.
- The major milestones for infants involve sitting independently (6–11 months), crawling (6–12 months), independent walking (18 months).
- Some children miss out the crawling stage and move on to standing and walking from sitting, if the walking is achieved later, e.g. 20–24 months, then this may be indicative of a child with low tone or of developmental delay.
- Children begin grasping objects during their first year, initially with both hands and then with one.
- The grasp begins to become more dextrous with sufficient precision being developed to build a column of blocks by the end the first year and hold a pencil by the age of 3.
- Dominance in either hand tends to develop after 2 years.

Speech development

- The earliest signs of communication occur when a child begins to point to objects (9–18

months).

- Between 9 months and 1 year children will begin to show understanding of simple words and sentences.
- During the second year the number of recognisable words increases so that by 3 the child will be able to distinguish between something being in or on something.
- Most children will be able to combine multiple words by the second year.
- Fluency in speech occurs by 4 years although when angry or excited they may stammer during their speech.

Hearing

- Infants react to sound from birth, by turning their eyes in the direction of the sound.
- By 4 months the child will turn towards the sound.
- By 7 months once sitting ability has developed the child will turn directly towards their parent or carer.
- A hearing impairment is often missed unless it is profound and identified by the child's parents.

Vision

- Infants will turn their head towards light and from 1–3 months an infant will fix on a parent's face and follow their own hand movements. By nine months they are able to see and poke small objects such as crumbs. By one year they will watch objects such as birds in a garden or a car passing by.
- The concerns of parents may help to discover impending problems, e.g. inability to fix vision.
- Potential vision issues in small children need to be assessed by an appropriately trained professional (Frost & Sharma 1997).

The management of children with neuromuscular disorders

- Duchenne muscular dystrophy is one of the commonest inherited diseases found in children and as a consequence physiotherapists working in community paediatrics will encounter these children in their practice.
- The role of the community physiotherapist is primarily to monitor those children who are at risk of developing debilitating contractures in the hips and around the ankles when the child is able to walk and then progressively in the remaining limb joints once the child becomes wheelchair-dependent.

- The physiotherapist will be responsible for teaching the parents/carers and school staff how to stretch the tendo-Achilles to maintain range of dorsiflexion and hip flexion in order to maintain range necessary for independent gait to be maintained.
- These will need to be carried out on a daily basis and the presence of contracture monitored carefully.
- Night splints should be provided to maintain the ankle in dorsiflexion at night and these tend to be ankle foot orthoses (AFOs).
- The physiotherapist should encourage regular, moderate amounts of active exercise in order to maintain joint motion, avoiding the use of resisted exercises.
- Aquatic physiotherapy will benefit these children, enabling joint motion to be maintained as the child has fun in the water.
- As the child shows signs of losing the ability to walk the physiotherapist will need to ensure that the child is referred to a specialist centre for the provision of knee ankle foot orthoses (KAFOs) and possible release of tendons such as the Achilles to facilitate joint motion compatible with achieving independent gait.
- The longer the child can remain able to walk the later they will develop the impending spinal scoliosis associated with constant wheelchair use.
- Once the child has been provided with KAFOs the physiotherapist in the community will be monitoring the ability of the child to maintain the ability to walk.
- With the loss of walking ability the child will need to be taught wheelchair skills.
- At this stage skin care will become important and will need to be reinforced with the child, parents/carers and school staff.
- Spinal posture will have an adverse effect on respiratory function and spinal jackets will need to be provided to prevent the deterioration of the spinal posture. At this stage the child will be monitored by the specialist centre for the need to operate to maintain the spinal posture (Eagle 2007).
- The reader is referred to the acute paediatric chapter in this volume for further detail regarding the management of neuromuscular disorders.

The management of children with musculoskeletal disorders

- Children will present with a wide range of musculoskeletal disorders, which may be managed by the physiotherapist in the school or home environment, however, there will be situations where a child may present with a problem or a condition that is beyond the competence of the community physiotherapist.
- In these cases it is important to liaise with musculoskeletal specialists either in the community or in the nearest specialist centre.
- The community physiotherapist should draw on their core knowledge and skills to manage children with musculoskeletal dysfunction.
- The reader is referred to the section covering the management of musculoskeletal

disorders in the acute paediatric chapter in this volume for further detailed information on the treatment modalities and approaches that can be used.

The management of children with neurological disorders

- Successful treatment of children with long-term neurological conditions will be dependent on the physiotherapist having an effective working relationship with the child's family and/or relatives or alternative carers.
- Physiotherapy treatment will be ongoing, often for the whole of childhood, but despite the amount of physiotherapy involvement it is the people who are with the child the most who will have the greatest impact on their development.
- A child may be referred for physiotherapy at different stages of the medical pathway, for example a child born prematurely or perhaps into a socially deprived environment where there is a high incidence of morbidity or alternatively where health and social care issues have already been identified, will ideally be referred to a number of community services on discharge from hospital.
- Many children will be referred later, with or without a diagnosis, with parents being aware or potentially unaware of their problems.
- The timing of the referral can impact on the relationship the family have with the physiotherapist. For example, does the family want the input, do they know their child has problems? Are they still in the stage of denial?
- Often the child's problems are not isolated. An initial need for physiotherapy intervention may sooner or later develop into the need for many other professionals and services to become involved in the child's management.
- Children with a disability often have a huge multidisciplinary team around them and reliable inter-professional communication is vital. Physiotherapists need to prioritise their time and establish which meetings or clinical appointments they should attend.
- The purpose of attending a meeting may be to provide or to obtain information, but it needs to be considered that both can be achieved through the provision of reports, emails, letters, and phone calls if necessary.
- The physiotherapist may find themselves the health representative within an educational setting or a child's advocate during a hospital clinic appointment.

The physiotherapist and their relationship with parents/carers

Developing respect and confidence

- The parents or carers are usually the most important people in a child's life, and therefore it is essential that they are able to respect and have confidence in their child's physiotherapist.
- There is a strong possibility that a physiotherapist will be working with a child and his or her family for a number of years, therefore the physiotherapist must strive to ensure that there is a positive working relationship.
- It is not trite to say, that the parents need to like their child's therapist.
- Setting up good early relationships is vital; it helps if the child doesn't cry every time that the physiotherapist pays a visit too!
- Some basic organisational details are crucial to getting off to a good start. Setting appointments at a time that is convenient for the family.
- Arriving for appointments at a previously agreed time.
- Setting up communication channels, whether via email or phone.
- Giving the parents/carers confidence that you are easily contactable and will return calls within a relevant time period are all small details that are key to developing a good effective working relationship with the child's family or carers.
- As with any service there must be access to interpreters and written information sheets or leaflets explaining what physiotherapy intervention entails, and what is to be provided by the therapist, and in turn what is expected of the family and other settings in providing the physiotherapy programme.
- Information must be presented in a way that is appropriate for the recipient and is respectful of the cultural or religious beliefs of the family or carers.

Skills required by the therapist

- Communication:
  - The most important of these is communication skills to enable effective working with the child, parent/s and the multidisciplinary team, including education and social services.
  - A small infant may be suspicious of anyone and will need to be engaged through their parent or carer, whilst the child is on their lap or playing on a mat with them. Parents can be taught how to carry out movements of the child's limbs or specific activities to encourage their developmental skills.
  - Treatment can be delivered through play and using toys, incorporating a game they like to play or a favourite toy.
  - Ask the people who know the child, they will tell you what motivates and what worries the child.
  - Negotiation may work with older children.
  - Non-verbal communication will indicate mood or feelings.
  - Be aware of your body language, e.g. sitting slightly turned away from the child with arms folded gives an impression of indifference. Leaning towards someone and mirroring their body language shows interest and empathy.

- Conflict awareness:
  - Be aware of the signs that a person is aggressive and angry.
  - Conflict awareness training can help develop the therapist's ability to deal with situations that can develop.
  - If treatment is likely to be contentious, plan in advance how to manage the situation, e.g. by having another person present, or seeing the family in clinic or at school where it will be easier to maintain control and support is present.
- Parents:
  - Be aware of the issues facing parents, e.g. if a child has been newly diagnosed the parents may be grieving for the expectations they had.
  - These expectations will need to change, but they need time, understanding and to be managed tactfully.
  - Acceptance can be variable, some parents will accept their child is unlikely to walk and act by being proactive, e.g. sourcing equipment to assist their child.
  - Others will need considerable support, only coming to terms with a diagnosis after several years.
  - Forcing issues around acceptance is likely to lead to them refusing to have you as their therapist.
  - Building a relationship with parents and the child takes time, but it is only when they trust you that you will be able to work together for the benefit of the child.
  - Listen to their concerns, be realistic but tactful in response.
  - A child's problems or disability may become apparent when they become older.
  - Children who seem to have many problems early on may improve beyond expectation and do well, unfortunately the reverse can also be true.
  - The therapist will need to help the families to maintain a positive outlook and assist them to deal with what can be major issues.
  - Admit when you don't know something, offer to go and find out the answer.
  - You need to be positive and reliable, if you say you will find out or do something it is important to fulfil the promise.
- Teaching:
  - Teaching parents management techniques can be done in a variety of ways:
  - Demonstration of exercises with the child.
  - Providing a written programme, including diagrams.
  - Guiding their hands so they learn kinaesthetically.
  - Photograph programmes are a really good way to motivate the child, and to show parents, carers or school staff how to position, use equipment or do an activity.
  - It is important to teach others how to effectively carry out therapy to ensure SMART goals are met and to maintain the confidence that parents have in you.
- Manual handling:
  - Manual handling and physical activity is a big part of the role of the paediatric physiotherapist.
  - The physiotherapist should be aware of the effect that treating children can have on

their body.

– Children with disabilities require a handling risk assessment to be carried out which outlines the process of handling required to reduce the risk of injury to anyone handling them.
– Organisations should have their own risk assessment paperwork.
– Any stooping activity should be interspersed with standing or sitting to avoid prolonged stress on the spine and lower limb joints.
– Equipment such as wheeled stools can make things easier when working with a small child.
– In a clinic or school setting there may be a therapy plinth that will enable the height to be adjusted to enable treatment to be carried out at a suitable height for the physiotherapist.

Working with the multidisciplinary team

- Within a paediatric setting, the medical team is extended to include education, parents, carers, social teams.
- Children with disabilities may often require a high number of interventions and support and within the school setting 'Statementing' is in place to enable the child to receive the support required to access and achieve an education.
- The Common Assessment Framework (CAF) and Team Around The Child (TAC) are used by education, health and social teams to assess a child's overall needs.
- CAF and TAC are also used when there are concerns about a child if they are considered to be at risk.
- This system is available to any child whether they have disabilities or not.
- The child and family may require support to deal with many issues, e.g. the family may need some respite care for their child to provide time for them to deal with family life.
- Respite care is often quite limited, but may consist of some hours per week, or a day or overnight stay in hospice or supportive accommodation.
- The therapist may need to liaise with respite care in order to teach a number of people how to carry out the child's physiotherapy or 24-hour positioning programme.
- Physiotherapy reports need to be both succinct and timely as they may provide a paediatrician or orthopaedic consultant with information about how a child is progressing, or not.
- Educational support for children under the age of 5 years can vary.
- Some areas may have a system called Portage, where an LEA (local education authority) employee visits the family at home to help with the child's development.
- Social services (renamed as children and families teams) have systems that oversee a child's safety and support children with disabilities to the extent of recommendations for housing adaptations.

Following the assessment

Goal setting

- When the assessment process has been completed the physiotherapist will formulate a problem list and in conjunction with the child and/or parents/carers set objectives for treatment. This should ensure that all parties understand the issues and the plan for managing these in the short and long term.
- It is critical to achieving a successful outcome that the child and the family have ownership of the objectives and enter freely into a contract with their physiotherapist.
- This should ensure that the child and their family or carers have a good understanding about exactly what their commitment needs to be.
- The physiotherapist will assess the child with a view to this being an ongoing process that evaluates the specific needs and enables the modification of treatment as indicated by the assessment findings. This should ensure that the treatments plan is successful and the goals are achieved.
- Each treatment session should effect a change in the child; if it does not achieve the desired outcome then this indicates that the treatment is not appropriate.

Standards and treatment guidelines

- Physiotherapists work according to a number of national and international standards and/or guidelines and in addition have to work within mandatory and statutory policies.
- The specialist area of community paediatrics requires physiotherapists to be aware of the additional legislation involved in working with children in the community.
- A physiotherapist working with children must be familiar with all of the regulations and guidance listed in Table 5.1.
- The reader is referred to the assessment volume for community paediatrics for additional working practices particular to working as a physiotherapist with children.

Table 5.1 Regulations relevant to physiotherapists working with children

Common assessment framework (CWDC 2009)	Identifies problems early and offers holistic co-ordinated approach to supporting families Non statutory guidance
National Skills Framework for Child Health and Maternity (DOH 2004)	Programme to improve children's health. Sets standards for Social Services and Health. For latest amendments refer to: DOH: NSF for child health and maternity
Convention on the Rights of the Child 1990 (UN 1990)	International laws protecting a child's civil, cultural, economic, political and social rights Formal agreement between states belonging to the United Nations

Education Act 1996 (UK Gov 1996)	Duties for educating children with special educational needs in mainstream or special schools Statutory regulation
Early Support 2010 (DCSF 2010a)	Supports parents and carers of disabled children aged five and under Covered by the Childrens' Act 2004
Transforming Community Services 2009 (DOH 2009)	Setting the agenda for commissioners and providers of community healthcare Guidance document
Working together to Safeguard children (DCSF 2010b)	The responsibility of all adults working with children Statutory guidance

Treatment environment

- Treating children in a hospital setting is relatively straightforward, with purpose-designed treatment rooms, plenty of space, relatively few distractions with equipment on hand to make the task easier to carry out.
- Treating in a hospital environment has many advantages; however, it is difficult to replicate the home in a hospital department.
- If treatment is organised to take place where the child lives, the interventions can be designed to fit realistically into the child's daily life.
- This can be repeated at school or other settings the child attends, so that a broader team is brought into the treatment process.
- The broader team will involve anyone who spends sufficient time with the child, such that they need to be trained in how to contribute to their physiotherapy programme.
- Treatment in school educational settings is obviously vital, but at the different stages in a child's life the emphasis of the interventions will change as the child matures and develops.
- Suitable rooms and privacy can become an issue as the child gets older, for example, while treatment within the classroom might be ideal in primary school, it is not appropriate when the child is attending mainstream secondary education.
- The transition between primary and secondary is often a time where the emphasis of therapy changes, as the pressures of time within a school day intensify.
- Physiotherapy within school may be about hands-on therapy, but it is also important to provide advice for PE staff or for staff to become familiar with the requirements of the child mobilising generally around the school environment.

When to treat

- This requires effective communication with the parents/carers to establish the times of day when maximum benefit can be achieved and also how often treatment sessions need to take place.

- Decisions need to be made about whether treatment takes place after a young child's day time sleep, rather than before or alternatively earlier in a tiring day, rather than later.
- As parents gain confidence in handling their child and develop an increasing understanding of their child's condition they may not feel they need to see the physiotherapist so often.
- At times of change such as transition or orthopaedic intervention the direct physiotherapy input may need to be increased to provide the more specialist input required to manage the changes that may be seen in the child.

Treatment following orthopaedic intervention

- Children often find themselves being seen by staff in both acute and community settings as they attend paediatric community appointments or are reviewed by an orthopaedic team in a hospital.
- The child may have a condition that requires this pattern of input from acute and community staff. An example of this would be any child with bilateral cerebral palsy needing to have a baseline hip X-ray taken by the time they reach 30 months, or perhaps earlier, if there is evidence of problems such as asymmetrical hip abduction, leg length discrepancies, wind-sweeping.
- The child in this situation is introduced at an early age to orthopaedic services, even if initially only for monitoring.
- Effective team working involves an orthopaedic surgeon and physiotherapists working together to consider intervention options and their timing.
- The success of orthopaedic interventions such as orthotics, serial casting, botulinum toxin injections, soft tissue surgery, bony surgery, multilevel surgery are all dependent on the team approach to the child's care.
- Following botulinum toxin injections or surgical intervention are specific times when the frequency and intensity of physiotherapy intervention will need to be increased quite dramatically, to ensure that the child will return to his or her previous levels of functional ability or to have the greatest impact on maximising the benefits of any procedure undergone by the child.
- Whilst tight or spastic muscles are weakened by the effect of botulinum toxin, opposing muscles should be re-educated and strengthened and this will need to be frequent and specific in order to maximise the benefit of the injections.

24-hour management

- A child's objectives can be met by considering their entire daily routine and thinking about how they could incorporate exercises into their everyday life. How a parent

transfers, carries or handles a young child will influence the child's alignment.

- If the parent is taught how to handle the child appropriately this can be used as a successful strategy to activate muscles.
- 24-hour postural management is another approach linking physiotherapy into the child's whole day.
- If one considers the amount of time during a 24-hour period that a child spends asleep it is important to manage their posture while they are asleep. Ideally the child should be positioned symmetrically in supine lying with the aim being to achieve the position of a Chailey ability level 3 (Box 5.1).
- There are several sleep systems commercially available or alternatively smaller T-rolls, pillows, cushions or cuddly toys can be used to influence a sleeping position.
- Some children of relatively low ability may also be spending time awake in lying, so their position may need to be controlled in prone, supine or side lying.

Box 5.1 Chailey level 3, supine lying ability

Maintains symmetrical posture

- Loadbearing through head, shoulder girdle, pelvis and feet
- Neutral pelvic tilt and shoulder girdle neutral giving general trunk curvature
- Hips abducted and externally rotated
- Chin tucked but not retracted and head able to turn freely from side to side
- Controlled eye movements possible
- Beginning of unilateral grasp to side of body, takes fist and objects to mouth

CHCS 2010.

Seating and standing frames

- Static chairs and wheelchairs will be used to control posture during the time the child spends in sitting (Figure 5.1).
- From the normal developmental age for standing, the use of standing frames can be included in the child's daily routine.
- In the early stages there are benefits to be gained from having an adult facilitate standing, so that they can be responsive to efforts being made by the child and to make the activity more dynamic.
- As the child grows in size a standing frame is a more realistic way that they can be facilitated to stand for prolonged periods of time.
- In the 'targeted training' therapeutic technique a frame may be used to support lower joints, as the child learns to control their trunk, pelvis and hips.
- Using a standing frame with thoracic support may not teach a child to stand, but it will affect them in a positive way psychologically as well as physically by holding their joints in a weight-bearing alignment.

- The area of seating provision crosses the boundaries between physiotherapy, occupational therapy and specialist wheelchair services in different parts of the UK, with the services having different roles.

Figure 5.1 Specialised seating is provided to maintain optimum sitting posture.

Individual or group work?

- Group work cannot completely replace one-to-one therapy sessions, but this can be a very successful way to integrate therapy into different aspects of a child's life.
- Early intervention, where families join in to work together with the physiotherapist and other members of the team can often bring about improved outcomes when compared to the child being treated by one person.
- Working together with other children and families can be very beneficial where both a child and parents have been isolated.
- The group work can provide opportunities for the children and the families to form relationships with others in similar situations.
- This can also ensure that educational as well as therapeutic targets can be integrated into the child's overall management programme by the team that is composed of early years teachers, speech and language therapists, occupational therapists and physiotherapists.
- The older child may become bored of continuing therapy and therefore they may be more compliant if they can meet and work with other children, either after school or during the weekends or holidays.

Treatment modalities (neurology)

- The choice of treatment modalities available is extensive and is predominantly determined by the objectives that are set and a child's underlying condition.

Floor work

Initial preparation

- Floor work and exercises are particularly useful if the child has abnormal tone. One of the initial priorities is to influence that tone, i.e. if tone is raised then it needs to be reduced and if the tone is low it will need to be increased.
- One of the approaches used frequently in the management of children with abnormal tone is the Bobath concept. The Bobath concept is useful as it includes tone influencing patterns as part of the intervention.
- Positioning, movement, facilitation, weight bearing and the use of gravity can all be used to influence tone and are all part of the preparation of the child for treatment.
- Children with neurological conditions may benefit from tone-influencing medication such as baclofen, taken orally or intra thecally with the physiotherapist being in the position of being able to monitor beneficial or detrimental effects of the treatment. There may be a variation through the day as doses are taken, or wear off.
- The reader is referred to the acute paediatric chapter for further information on pharmacological management.

Alignment

- The preparation is then followed by improving alignment in all appropriate positions.
- This may include the alignment of the head on the trunk, the trunk over the centre of gravity and limb alignment.

Muscle activation

- With tone and alignment influenced the child needs to actively move.
- Their muscles need to be activated, especially the muscles important for maintaining appropriate body position and function.
- If a child cannot perform a movement, then facilitation techniques can be used to assist them to achieve the desired movement.
- As the child's own movement improves the therapist withdraws their support more and more.
- It is important to consider the joint range to work in, e.g. if a child lacks full hip extension in standing, then it will be the inner range of the hip extensors that must be targeted.
- Although muscle weakness may not be the primary problem, it is often found as a secondary problem in conjunction with other issues.
- Children with cerebral palsy will be at increased risk of losing function during growth spurts, muscle strengthening has been advocated as a method of improving function without increasing the level of spasticity (Dodd et al 2002).
- These children may not be able to isolate individual movements and their weakness will

be in particular muscle groups.

- Functional activities can be used to develop muscle endurance and power, e.g. the child can be asked to assist as they are brought up to a sitting position from lying down.
- Exactly the way in which the task is achieved will influence correct activation of the neck and trunk muscles.
- Often introducing rotation into a gross functional movement will enable specific muscle groups to be worked.
- As a child is able to move into standing this provides an opportunity to introduce dissociation of one lower limb from the other if they perform the manoeuvre through half high kneeling.
- Consider which leg the child prefers to lead with to achieve the desired outcome. The leading leg should take more weight and the extended hip can be encouraged to achieve greater hip extension.
- As a child prepares to stand up, then they can be discouraged from using their hands and this in turn will increase the effort required from the lower limb extensors to achieve standing.

Stretches and passive movements

- There is a lack of consensus amongst paediatric physiotherapists about the effectiveness of stretches and passive movements.
- They are considered by some to be useful for improving muscle flexibility.
- Spastic muscles stiffen when not being used, therefore helping a child move their limbs is thought to improve flexibility and prepare muscles for work.
- Movements can be performed that mirror normal movement to give a child the feeling of normal movement patterns.
- Profoundly disabled children may have little active movement, therefore passive movements of their limbs can provide experience of normal movement.
- It is also thought that contractures may be prevented and muscle spasm inhibited by applying sustained stretches.
- Various techniques are used in practice, e.g. shaking a limb and applying traction whilst moving the limb out of a spastic pattern.
- It has been found that for effective muscle lengthening to occur the stretch should be held for 6–8 hours a day.
- To achieve the prolonged stretches splinting using ankle foot orthoses can maintain a good position at the ankle to lengthen gastrosoleus and increase ankle range of movement (Teplicky et al 2002).
- Sleep systems, standing frames, supportive seating or adaptive wheelchairs can assist in maintaining alignment, symmetry and muscle length.
- Passive stretches alone are unlikely to be effective for increasing range (Pin et al 2006).
- There is evidence suggesting sustained stretches to be superior to manual stretches for the reduction of spasticity and improvement of range.

- Rapid periods of growth (spurts) can affect biomechanics and this can be predicted to a degree as children tend to have growth spurts around age 6–7, again aged 9–10 and finally before and around puberty.
- The pre-pubertal growth spurt is earlier in girls, around age 10–12, and in boys, as late as 14–16 years.
- Rapid growth initially occurs in bones with soft tissue catching up more slowly.
- Activities to maintain flexibility can help reduce problems associated with growth.

Constraint induced movement therapy (CIMT)

- Constraint induced movement therapy (CIMT) is a method used to improve function in the affected limbs of stroke patients and with children presenting with cerebral palsy.
- There is some evidence to support the use of CIMT in rehabilitation of appropriate patient groups (Taub et al 2004; Hoare et al 2009).
- The child is encouraged to use the affected arm whilst some form of restraint is applied to the non-affected arm.
- Various forms of restraint have been tried and for varying lengths of time.
- If this is going to be something the families continue with it has to be manageable from their perspective.
- A group session can be a very successful way to first introduce the treatment. The physiotherapist needs to come up with many imaginative ways to engage the child in new and interesting activities that are geared to making them use their affected arm.
- To ensure success the activities have to be carefully chosen and the less able children need to be assisted through facilitation to succeed.
- Activities can be functional and could include making a sandwich, dressing up games, fun activities such as lucky dips, where the child immerses their hand in sand to search for hidden treasure or drawing pictures on a mirror covered in shaving foam.
- The restraint should be as little as possible, e.g. a child could be provided with a glove to wear on their unaffected hand.
- This helps them and others to identify which hand they should not be using and discourages use of that hand.
- At home the parent would need to identify games that are specifically chosen for the CIMT sessions.
- The sessions should be run for a realistic length of time, e.g. from 30 minutes up to an hour will be a useful length of time to achieve benefit.

Hippotherapy

- Also known as riding for the disabled, hippotherapy may or may not be provided as one

of the community services in a child's local area.

- There are numerous benefits claimed for hippotherapy, ranging from improvements in tone, postural mechanisms and functional abilities (Silkwood-Sherer & Warmbier 2007).
- The movement of the horse is transmitted to the rider providing rhythmic three-dimensional movement that is thought to stimulate the sensory and motor systems within the child.

Aquatic physiotherapy

- The physiotherapist faces additional challenges when working in a pool.
- They must familiarise themselves with the operating and emergency procedures and practise the evacuation procedure.
- It is important to feel comfortable and be relaxed in the pool, nervousness or tension is picked up by children.
- The depth of water affects stability, with water at waist depth around 50% of body weight passes through the feet enabling stability to be maintained during the delivery of manual resisted exercises.
- The child should be assessed prior to attending for pool treatment, what this will involve will depend on the child's diagnosis.
- Conditions that can benefit from aquatic physiotherapy and some of the challenges (Figure 5.2):
  - Juvenile idiopathic arthritis
  - Cerebral palsy, due to increased tone, there will be higher muscle density, which can cause affected limbs to sink
  - Hemiplegia, the child has to learn to counteract horizontal rotation in lying when one side sinks in comparison to the other side
  - Diplegia, altered balance and possible muscle wasting may entail a child needing support to prevent them from having their head thrust under water.
- The Halliwick concept of teaching swimming to people with disabilities is a method of using the properties of water to enable confidence and some measure of independence to be gained.
- Breathing control and confidence are taught to enable the child to relax and be able to listen to and learn new instruction.
- Games can be used to help motivate and can be individual or carried out in groups. Balance in the water both vertical and horizontal needs to be gained so the child recognises when they are in the correct position, and can correct themselves if they move out of this.
- A child can be encouraged to turn to look at someone to start a movement, following the movement with the arm will assist the child to roll. See Figure 5.3.
- Praise needs to be instantaneous to encourage younger children or those with learning difficulties to try again to achieve a goal.
- A child must learn to float on their back, and this is usually achieved once the child is

confident working with an adult, and have become familiar with being in a pool environment.

- Initially this may be achieved by them lying back with their head on the adult's shoulder.
- This is progressed to supported floating, independent floating and learning to propel independently through the water. See Figure 5.4.
- Independence in the pool environment can be started in the changing room. The child can be encouraged to roll, sit, and help to change themselves.
- Child protection must always be considered, and changing should be appropriate. Modesty is important to children and care should be taken to ensure this is respected and that the child has a say in how they are changed and by whom.

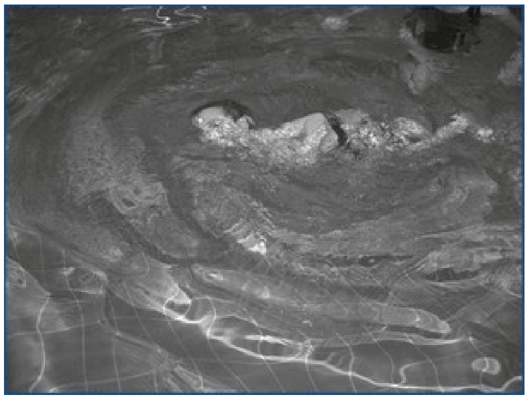

Figure 5.2 This picture shows a child happily playing in the water and independently propelling himself. He has learnt to hold his breath, or to blow bubbles to prevent water entering his mouth and nose. He is unable to swim with his head above water whilst in prone.

Figure 5.3 Rolling from back to front independently.

Figure 5.4 This child with quadriplegia has learnt to float independently. The head is tipped back to assist with horizontal position and helps keep the legs and pelvis floating. Arms are spread and as relaxed as possible. High muscle tone prevents limbs being straighter.

Fun

- Children need to enjoy their physiotherapy sessions and the physiotherapist must be prepared to be imaginative and flexible when trying to achieve treatment goals.
- For a session to be successful it is important to know what level of cognitive skill a child can perform to and also their personal interests.
- It helps to be knowledgeable about trends in toys, books, music, television programmes and characters.
- It pays to watch children's television; use a child's own toys or take toys on visits with you.
- Positive reinforcement by praise, use of stickers, star charts, and certificates will further help with compliance and enjoyment.
- Descriptive commentary is an effective technique when working with children with underdeveloped language.
- The challenge with teenagers is maintaining their motivation.
- This can be achieved by incorporating sports or the Nintendo Wii into their routine to enable them to improve their skills and fitness.
- Encouraging exercise is important for their life after school and is a fun way to make friends.
- Paralympic competition in recent years has raised the profile of the variety of sports available, and access to special needs sport has improved (www.paralympics.org.uk).
- There may be support from a local disability sports officer in setting up local sports.

Equipment

- As an adjunct to the repertoire of techniques that the physiotherapist may use to achieve

a child's goals, it is useful to consider the role of equipment.

- Equipment can assist the physiotherapist to position a child, for example, or to facilitate functional activity (Table 5.2).

Table 5.2 Equipment to assist in the treatment of children with neurological conditions

Equipment	Therapeutic use
Gaiters	To extend elbows or knees for a variety of reasons, including activation of more proximal joints
Gym ball or cushion	To provide an alternative base of support that in turn will induce different reactions within a body
Walking aids	Tripod or quadruped stakes, k-walkers with support from behind, to influence extension activity, with a rollator providing the support from in front
Stools	For working between sitting and standing
Ladders	A remnant from Conductive Education but providing functional support as a child attains standing (Peto Institute 2010)
Tricycles	Offers an alternative form of independent mobility
Wedges	Influence tone, alignment and ability level in prone
Kinesio taping	Aligning tissues, offering sensory, positional or mechanoreceptor stimulation

Orthotics

Background knowledge

- Physiotherapists working with children will encounter orthotics on a regular basis and therefore it is necessary to develop a basic knowledge of the types of orthoses and their application as they can be used as an adjunct to physiotherapy treatment and management.
- It is important to develop the knowledge and ability to identify why an orthosis may be of benefit to a child and then to refer the child to the nearest paediatric orthotist.

Function of orthotics

- Orthoses are externally applied medical devices used to modify the structural and functional characteristics of the neuromuscular and skeletal systems (International Organization for Standardization 2007).
- Orthotics are used to:
  - Provide stability
  - Correct alignment using force systems

– Minimise, correct or prevent further deformity
– Provide protection, e.g. protective helmets
– Improve function
– Facilitate and/or improve quality of movement/gait
– Reduce pain.

Examples of orthoses

- There is a wide range of pre-formed orthoses available to use in the management of children.
- The following list includes a few examples of the most common orthoses that will be encountered during a period of working in community paediatrics (Figures 5.5-5.12).

Figure 5.5 Supportive orthopaedic footwear.

Supportive orthopaedic footwear (Figure 5.5)

Trend for supply has reduced. Particularly useful for ankle instability which is delaying the child's development and/or affecting balance; however the weight of this footwear can make walking more difficult.

Insoles, functional foot orthoses (FFOs) (Figure 5.6)

Can be made from variety of materials depending on support required. Are used to improve foot position on weight bearing. These can be used to correct a variety of deformities, e.g. forefoot or hindfoot planus or cavus. Judicious use is required in relation to the bone growth potential of the child.

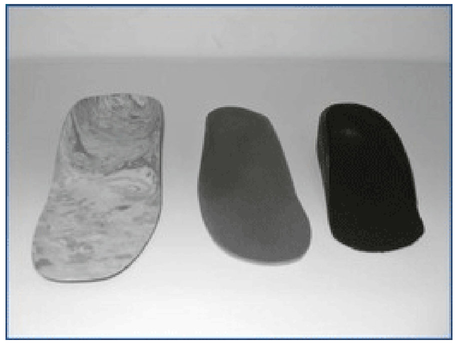

Figure 5.6 Insoles, functional foot orthoses (FFOs).

Ankle foot orthoses (AFOs) (Figure 5.7)

A plastic shell encompassing the posterior calf, ankle and foot. Applies three points of pressure to limit ankle dorsiflexion or plantarflexion. The splint may also be hinged if there is a need to limit only one of these movements. AFOs are commonly used in the management of the child with a neuromuscular condition. The same principle is used for night splinting to prevent the loss of extensibility in the calf muscles, e.g. in children with Duchenne muscular dystrophy.

Figure 5.7 Ankle foot orthoses (AFOs).

Knee ankle foot orthoses (KAFOs) (Figure 5.8)

Most often used to compensate for week knee extensors. Are commonly used in the management of muscular dystrophy to prolong the ability of the child to achieve an independent gait.

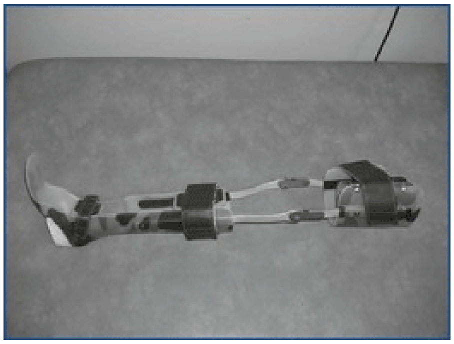

Figure 5.8 Knee ankle foot orthoses (KAFOs).

Sitting Walking And Standing Hip orthosis (SWASH) brace (Figure 5.9)

This brace facilitates hip abduction when the hip is flexed. It was originally designed for a walking child, but has been adapted for use with children when they are sitting in order to improve their base of support and stability.

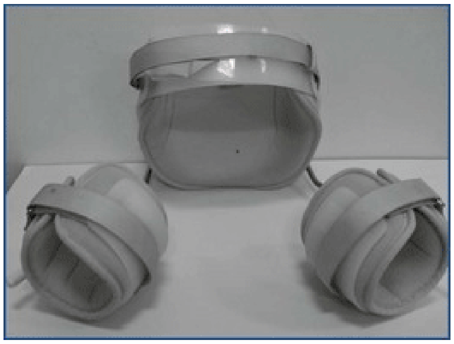

Figure 5.9 SWASH brace.

Dynamic Elastomeric Fabric Orthoses (DEFOs) (Figure 5.10)

These are also known as Dynamic Movement Orthoses (DMOs) or Sensory Dynamic Orthoses (SDOs). They are made of a Lycra based fabric. Additional layers of reinforcing material add a biomechanical influence and encourage improved movement control and proximal stability.

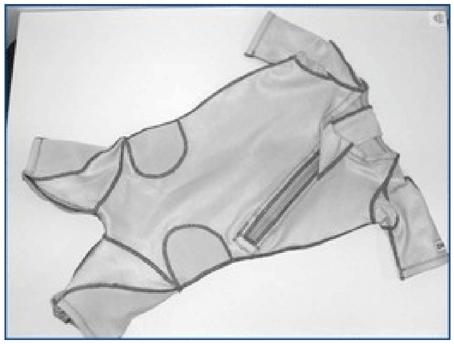

Figure 5.10 Dynamic elastomeric fabric orthoses (DEFOs).

The increased pressure on certain muscle groups is reported to improve proprioception. Most common DEFOs are the suit, glove and sock.

Spinal jackets (Figure 5.11)

Provided to offer correction and/or support to the spine. They are used to minimise the development of a scoliosis where the child has inadequate trunk control to prevent a scoliosis.

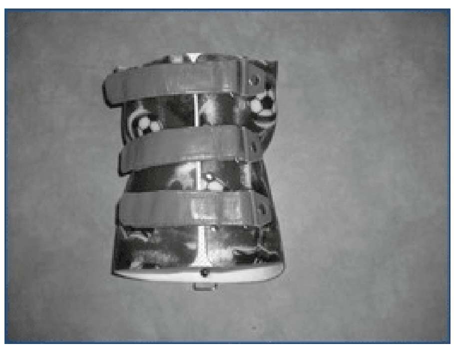

Figure 5.11 Spinal jacket.

Head protection (Figure 5.12a, b)

Provided for children who have a tendency to experience falls or who are likely to self-inflict injuries as a result of uncontrolled movements.

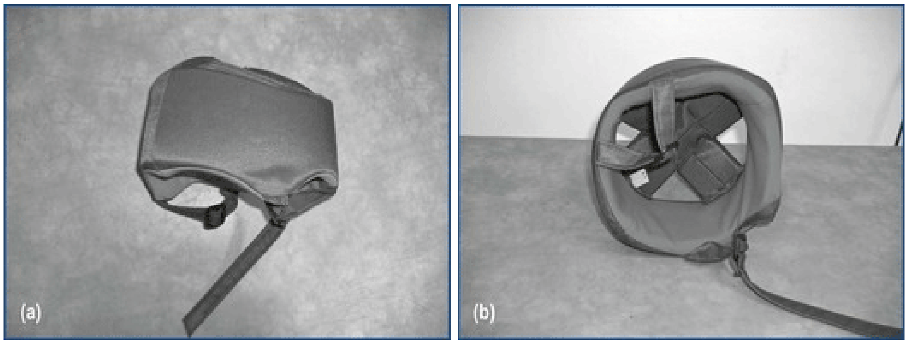

Figure 5.12 (a and b) Head protection.

Co-ordination difficulties

- Children may present with a wide range of difficulties with co-ordination.
- There are many reasons for poor or below expected age motor learning patterns including ligamentous laxity, learning difficulties, low muscle tone or prematurity and dyspraxia.
- The pattern of intervention may be very different depending on the child's diagnosis.

Ligamentous laxity

- The list of clinical findings seen in ligamentous laxity may include:
  - Hypermobility
  - Low muscle tone
  - Slumped posture or poor ability to maintain a good posture for any length of time
  - More physical effort to do things
  - Poor stability around the pelvic or shoulder girdle affecting both balance, quality of running and gross motor tasks, and difficulties handwriting
  - Poor anti-gravity abilities which can be assessed both in supine flexion, prone extension and during functional activity
  - Difficulties with stability and compensative fixation may lead to imbalance
  - Postural background may be rigid to compensate
  - May have flat feet and be 'heavy' when stepping, or may find it hard to jump or hop
  - Unless the child has symptoms of pain or limited function they may not require intervention other than advice on supportive footwear, and on suitable sporting and play activities to maximise their potential. A more affected child will need therapy aimed at improving joint stability, core strength and possibly co-ordination and fitness. They may benefit from orthotics if foot pain is present.

Low muscle tone

- Children may show some of the following signs and symptoms:
  - May have been slow in feeding
  - Later than average standing and walking age
  - Unsteady on feet longer than average
  - Slumped posture
  - Poor gait
  - Tired after a short walk
  - Poor concentration and easily distracted
  - Tire over the week and over a school term
  - May show difficulty in tasks involving (finger) strength.
- Children who need support from therapy should be worked in such a way that they increase their muscle tone, and then work different muscle groups for short periods, changing positions and muscle groups before they tire too much.

Developmental co-ordination disorder (DCD)

- The existence of DCD and the impact it can have on the general well-being of the affected children has been widely recognised, although the underlying causes of the condition are unclear.
- DCD can be defined according to the following criteria:
  - There may be marked delay in achieving motor milestones, e.g. sitting, crawling or walking, dropping things, 'clumsiness', poor performance in sports, or poor handwriting.
  - The disturbances above interfere with academic achievement or activities in daily living.
  - The disturbance is not due to a general medical condition, e.g. cerebral palsy, hemiplegia, or muscular dystrophy and does not meet the criteria for a pervasive developmental disorder.
  - If learning difficulties are present the motor difficulties are in excess of those usually associated with it.
- The prevalence of DCD, estimated on the basis of the above-cited criteria, is as high as 6 % of all 5- to 11-year-old children (APA 1994).
- Many children may know by the age of 5 that they are unable to compete with their peer group, and may seek out ways to avoid physical activities they find difficult.
- This can include ignoring instruction, behavoural difficulties, joking and playing around or tears.
- Treatment should concentrate on functional behaviour.
- The therapist should aim to provide a motivational climate in which the CNS is forced to consider a proactive monitoring of movement execution in different tasks and environmental circumstances.

- Postural control deficits can hamper the efficient acquisition of motor skills, therefore the use of whole-body tasks is preferential to isolated motor exercises.
- Treatment should be directed towards 'functionality' but also teach the child to cope with 'dysfunctionality'.
- By offering children experiences of success and teaching them to deal with unsuccessful performance therapists can fulfil an important psychological role in the prevention of emotional problems (Deconinck 2005).

Management of children with respiratory disorders

- The management of children with respiratory disorders in the community can be considered to include management in the child's home and also during the time spent in the school setting.
- Children with long-term conditions may get respiratory infections or complications that require treatment.
- Central to maintaining the child at home are the parents or carers who will be able to monitor the child and seek help when they develop a respiratory problem.
- Parents will learn to identify problems and will either contact their GP for medication such as antibiotics or contact the paediatric service where the child is under consultant management for an urgent appointment.
- The role of the physiotherapist in the home setting in most cases is to assess, to provide education or to refer the child to other services.

Management of lower respiratory tract infection

- Physiotherapy intervention should be provided for the same reasons as those considered for the treatment of adults, i.e.
  - The removal of secretions
  - Management of conditions with chronic sputum production, e.g. cystic fibrosis
  - To assist those with an ineffective cough, e.g. in neurological and neuromuscular conditions
  - To assist those with a depressed cough, e.g. due to presence of pain
  - Where the effort of breathing is very demanding
  - Where a ventilation-perfusion mismatch occurs (Hardy 2007).
- Parents or carers should be taught assistive coughing, especially for children with reducing peak flow readings.
- The child may be taught glossopharyngeal breathing to assist air entry and enhance the

effectiveness of coughing (Eagle 2007).

- As medical management has improved so too has the lifespan of children that would previously not have lived to the point where they develop respiratory complications.
- Increasingly, home ventilation is being required for children with Duchenne muscular dystrophy.
- Evidence now shows those being ventilated and having corrective spinal surgery living until 30 years and those being ventilated surviving until their early twenties (Eagle et al 2007).
- The community physiotherapist is now likely to encounter the interventions that were once the preserve of the intensive care environment in the acute hospital setting and the development of these skills is something that should be considered by a physiotherapist planning to work with children in the community.
- In the UK non-invasive ventilation is the preferred choice with nocturnal ventilation being used in the initial stages as the child begins to demonstrate signs of respiratory failure.
- Daytime ventilation is used as the individual gets older and respiratory function deteriorates.
- The maintenance of the power supply and a possible emergency power supply should be considered and put in place to provide adequate power supply to the ventilator in the event of a power cut.

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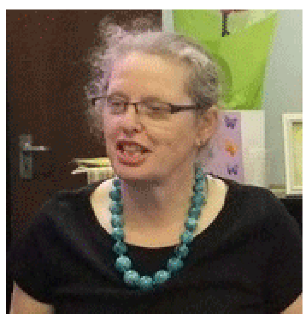
Chapter 5

E-materials

Author profiles

Sally Braithwaite MCSP

Sally qualified as a physiotherapist in 1978 from the Joint Services School of Physiotherapy and has worked with children for most of her career. Sally has had the opportunity to work in most of the specialist areas of paediatrics and as a result has a wealth of experience. Sally settled in Birmingham thirty years ago where she has worked predominantly in community settings. She has particular interests in children with developmental co-ordination disorders, and continues to see a large number of children with common and less common paediatric conditions. Sally is currently Professional Clinical Lead for Physiotherapy in Birmingham Community Healthcare NHS Trust, but will be retiring to spend time with her husband and five grandchildren, developing her garden, reading, painting and travelling as extensively as possible.



Karen Edwards MSc MCSP

Karen is now a clinical specialist physiotherapist working as part of the Movement Disorder Service at Great Ormond Street Hospital. She previously worked in the community setting for 20 years and has a particular interest in the orthotic management of children with movement disorders. She is an experienced clinical educator and has contributed to the undergraduate programme at University of East London.

Julia Hyde BSc(Hons) MCSP

Julia Hyde completed an Honours degree in biological sciences at the University of East Anglia before commencing physiotherapy training first at Withington Hospital, Manchester then qualifying from Addenbrooke's Hospital, Cambridge.

She has worked in Community Paediatrics for over 20 years in Oxfordshire.

She is Bobath trained, an iCSP paediatric moderator and the clinical governance, children's rights and clinical educator lead for her service.

Pauline Norris MCSP

Pauline qualified in 1990 from Coventry School of Physiotherapy.

She has worked as a Paediatric Physiotherapist since 1992 and has experience of both acute and community settings within the NHS in Buckinghamshire, Gloucestershire and Oxfordshire and has been Head of Physiotherapy for a residential school run by a charity.

Pauline currently works for the NHS in Oxfordshire with children with delay and disability. Her particular interests are Disability, Hydrotherapy, Cerebral Palsy and Developmental Co-ordination disorder.

Janine Rutland GradDipPhys MCSP

Janine started her career by training as an orthopaedic nurse followed immediately by training as a physiotherapist at the Prince of Wales School in London.

Rotations as a junior were completed at Ipswich General Hospital followed by a period as a senior clinician at Colchester General Hospital.

Following a career break to raise her two children Janine has specialised in community paediatrics working at the Avenue School in Reading for the last ten years.

Acknowledgements

Peter Evans, Tebbit Centre, Nuffield Orthopaedic Centre.

Appendix 5.1 Issues to consider in a nursery setting

	Possible barriers	**Possible solutions**

Daily therapy programmes	Time	Programmes constructed to integrate into nursery activities Some aspects of programmes to be delivered by parents at home
	Someone to carry out the programme	Several staff trained to deliver the programme so it can be shared In-service training for nursery staff delivered by therapist
	Training for staff	Attendance at relevant external courses Provision of a statement if special educational needs should provide financial support towards individual input for a child
Using postural management equipment	Finance	Funded via statutory or possibly charitable provision (health or education) Look for pieces of kit that may provide multiple functions Keep kit as small as possible
	Provision of equipment Storage space Manual handling training of staff for effective, efficient and safe use	Staff should attend manual handling training but a therapist should advise on use of equipment for individual children (how to get children in and out, the time equipment should be used for, how to check regularly to keep in good order, etc.)
Use of orthotics	Staff are afraid they might hurt a child Occasionally staff link orthotics to handling that they associate with child protection issues	Staff should be given very clear instructions on the use of orthotics – how they should be taken off and put on, duration of use, what to do if they have any problem
Use of mobility equipment	Crowded environment with lots of toys on the floor Staff are often initially worried that a child my fall	Choose kit that is stable and a child is fairly confident to use Practice therapeutic walking in a clear uncongested area Use a buggy or wheelchair in situations where it is just not safe to use walkers Ensure that staff are aware of policies to follow if a child hurts himself Teach a child how to get up from the floor and ensure staff know how this should be encouraged

Appendix 5.2 Some issues to consider in a primary setting

	Barriers	**Solutions**

Small and often crowded classrooms	Little space for the use of positioning equipment Difficulty moving around with mobility aids	Consider the place a child sits in the classroom Being near the door offers easy access and is nearer to a toilet should this be necessary in a hurry Use of equipment and mobility aids
Sitting on the floor	Not always possible to be able to work at the same height as peers If only able to sit with legs out, others may trip over and not enough space	Sit on a small chair Sit on a floor cushion used to mark a place with enough space Specifically identify a suitable space for a wheelchair or supportive seating which ensures safe access for the whole class
PE and swimming	Health and safety issues for both child and staff Child not able to keep up with peers Child cannot cope with the cold for some outdoor activities Not able to access standard equipment	Appropriate training for staff in both manual handling and differentiation of activities Alternative activities to do with a small group when it is cold outside Possible alternative activities – swimming or horse riding Plan, e.g. swimming, choose a pool with suitable access and ensure that pool staff are aware of the special needs of the child
Break and lunch times	Crowded situations where children often like to rush around Specific difficulties with controlling food in the mouth Difficulty managing dinner trays and cutlery	Health and safety training Liaise with OTs and SALT Position at the beginning or end of the queue Identify a place in which a wheelchair or supportive seating will fit
	May have some kind of tube feeding	Training for staff for tube feeding and the identification of a suitable place for this to happen
Personal care	Child protection issues Manual handling Access to toilets is often difficult	Appropriate training in many of these areas is essential OT advice re hoisting and suitable adaptations Track hoisting may help small space issues
	Unable to toilet independently Incontinence	More than one person trained to manage all personal care situations
	Catheterisation Unable to change independently for swimming or PE	Try to have PE or swimming first lesson of the day so children can come ready changed under their clothes

Appendix 5.3 Issues to consider in a secondary setting

	Barriers	Solutions
Access	Large sites with more than one building	Try to identify smaller schools Advice from OTs
	Multiple floors with many steps and stairs	Lifts
	Needing to change rooms for different lessons Specific furniture for labs, etc.	Consider timetabling, group lessons into 1 building or on 1 floor Extra time to move around Wheelchair accessible furniture
Increased demand on work output	Poor hand function Needing to use specialised equipment	Advice from OT Scribe for exams and everyday work Assessment for and provision of specialist kit with the training for staff and child – e.g. computers with tailored access
	Fatigue	Identified space for rest periods Shorter days Extra time to complete tasks
Peer pressure and no peer group	Poor understanding of disability	Specifically targeted PSME Not to be the only child with a disability in school

Case Study 5.1

Background

- John, a 12-year-old boy, lived with his parents and younger brother in a single storey dwelling.
- He was an active boy always playing football with his friends or out on his bicycle.

HPC

- John was knocked from his bicycle by a hit-and-run driver.
- He sustained a head injury including a fractured skull, multiple fractures of the upper and lower limbs and thoracic cage.
- John was taken by helicopter to the nearest trauma unit and was in ITU initially for 5 weeks.
- He was transferred to the rehabilitation ward and remained there for 4 months.
- John continued rehabilitation as an outpatient, and by 9 months it was thought that improvement from rehabilitation had slowed and that he would benefit from the teaching provided by a special school, where he would be able to receive intensive rehabilitation alongside his schooling.

School

- At this stage John had little in the way of independent function apart from head control and he had communication difficulties.
- The special school enabled John to have daily physiotherapy and to receive input from different specialists within the school.
- John showed significant improvement during the year in his function and ability to communicate and was showing signs of improving academic abilities.
- Therefore it was considered appropriate to transfer John back to his mainstream school as it was felt that this would provide the stimulus and challenge to enable him to maximise his potential.
- Planning and meetings were crucial to ensuring a smooth transition.
- The team necessary to support John included: physiotherapists, speech and language and occupational therapists, teachers and non-teaching staff, educational psychologists.
- A joint professional approach was important to ensure the provision of the required level of ongoing rehabilitation and treatment that John needed alongside the school work.
- The physio- and occupational therapists provided training for the school staff and helped to problem solve any issues involving the integration of John into the normal routines of the school.
- Following the preliminary meetings any equipment that had been identified as being required was ordered.
- The physiotherapist and one of the school staff began the process of preparing school staff for their roles in helping to integrate John back into the school.
- John made steady progress in his independent function, communication and academic abilities over a 2-year period.
- Ongoing therapy sessions at school and attendance at aquatic pysiotherapy sessions and rehab sessions outside of school meant that John achieved the ability to stand with support and walk with walking aids and the support of 2.
- John has a teaching assistant who is dedicated to him at school who is able to ensure school staff are updated on any new approaches to his management that are undertaken by the therapists in or outside of the school.

Summary

- Communication is the key factor in the successful management of a child such as John once they have been discharged from hospital.
- Involvement of school staff is essential to ensure that any rehabilitation requirements are fully understood by school staff and the aims of treatment are reinforced.

Case Study 5.2

Background

- Z was a 17-month-old boy referred to local children's services by his GP because of delayed motor development.
- On 2 previous occasions the GP had reassured his parents that he may be delayed because he is a boy and they generally are slower than girls.
- The referral was allocated by the referral panel to Physiotherapy only based on the GPs information stating 'developmental delay – not walking'.

Assessment

Observation

- In the waiting room, Z was supported by his mother in standing to enable him to play at a table. He was standing on his toes and patterns of movement in his upper limbs were of concern.
- He presented with significant plagiocephaly.
- In the assessment area Z was placed in long sitting with a toy between his legs by his parents.
- He presented with posterior pelvic tilt, bilateral hip internal rotation and adduction, and bilateral equinus.
- He was unable to play with the toy as he needed to use his upper limbs to maintain his posture.
- When unable to maintain his balance he fell backwards, displaying a startle reaction with both arms going into high guard position.
- There were no saving reactions.
- Once in supine he was unable to move from this position independently and became distressed.
- When supported in sitting on his mother's lap Z was happy to interact by smiling and making sounds.

Subjective assessment

- Pregnancy was uneventful and Z was born at term via normal vaginal delivery.
- Birth weight was 7lbs 4oz.
- Z was stiff from birth.
- He was awkward to dress and it was difficult to separate his legs to change nappies.
- Motor milestones were delayed (no rolling or crawling) and balance in sitting had only recently been achieved.
- He cried whenever in unfamiliar surroundings, especially if someone new walked into the room.

- Z seemed to get more frustrated and angry than other children his age.
- Other people could not understand his communication methods.
- Feet have always been pointed down.
- No vision or hearing problems.
- He preferred using one hand.
- Finger feeding picking up food between thumb and fist.

Objective assessment

- Smiling appropriately.
- A good understanding of simple instructions.
- Good relationship with parents.
- Visually exploring environment.
- Hypertonia in both upper and lower limbs; most evident in calf muscles and hip adductors.
- Limited passive range of dorsiflexors.
- Difficulty dissociating movement between one leg and the other.
- He was unable to roll, cried when assisted and was scared of movement when supine. Possibly not used to experiencing movement.
- He could be placed in sitting, but was unable to play in this position.
- He did not like being in prone as he was unable to push up on his arms.
- He had no form of independent mobility.
- Ability to use two hands. Hand preference evident with one hand predominantly fisted.

Treatment

- Findings were explained to parents and Z referred to Child Development Centre (CDC) for multidisciplinary assessment.
- Referral was made to occupational therapy for assessment for equipment, which would enable him to play in sitting.
- Referral made to speech therapy due to the delay in his communication skills.
- Advice was given to parents on activities to try to introduce movement to Z on the floor.
- Parents taught how to do calf stretches and advised to do these at every nappy change time.

Review 3 weeks later

- Parents reported they had worked on all activities advised, and included his sister and extended family in these activities.
- Z able to roll independently and beginning to push up in prone.
- No longer scared of being moved or moving on the floor.
- Able to move away from people who entered the room and he no longer cried.

CDC assessment at 21 months

- It was confirmed that he was presenting with a condition similar to cerebral palsy. Further investigations, e.g. blood tests and MRI brain scan were required.
- Parents were introduced to the Early Support Coordinator who provided them with information.
- The physiotherapist was nominated as Key worker due to the relationship he had with Z and his family.
- Family also introduced to services at local Children's Centre, including access to a playgroup for children with additional needs.
- The physiotherapist attended play group to advise staff on activities to encourage Z's motor development.
- Z continued to progress and one month later he was able to move into sitting and could attain a 4 point kneeling.
- Physiotherapy sessions included activities in standing.
- Z's foot position in standing was poor with instability at his ankles. He was seen by an orthotist who prescribed specialist footwear and FFOs.
- Physiotherapy sessions emphasised setting collaborative goals and teaching and advising family on which activities they could assist, in order to help Z achieve these goals. The time between sessions was dependent on Z's progress as well as his and his parents' needs. Sessions ran at home or in a Health Centre.
- Regular Family Service Plan meetings arranged and chaired by the key worker.

Nursery education

- By 2½ years discussion on nursery placement had begun and physiotherapy advice was submitted to the local authority for Z's Educational Statement as per the Education Code of Practice.
- At 3 years Z attended nursery 5 mornings a week and was fully supported by a 1 : 1 Learning Support Assistant.
- Key worker responsibilities transferred to the SENCO (Special Educational Needs Coordinator) at the nursery.
- Physiotherapy treatment sessions continued in the nursery during term time, and principles were continued on a daily basis by the LSA.
- The sessions included specific exercises and activities, e.g. exploring the outdoor equipment.
- Advice was also given regarding specialist equipment.

Outcomes

- At 3½ Z began to take independent steps.

- Poor foot position made him unstable and he lacked confidence to step.
- AFOs were discounted due to the potential for pressure areas.
- Z was referred to a tertiary centre for assessment for Botulinum toxin injections into his gastrocnemius and tibialis posterior muscles and following this he was able to tolerate bilateral AFOs and the range of dorsiflexion improved.
- His mobility improved and he was able to walk independently around nursery.
- His parents visited SEN and mainstream schools to decide which will meet Z's needs. Physiotherapy advice was provided throughout this process.
- At 5 years Z started at a mainstream primary school, with an LSA allocated to him for 20 hours.
- He continues to progress in all areas; walking around school independently. Although he remains unsteady he can jump and is beginning to run.
- Diagnosis remains uncertain.
- Z continues to be seen by a physiotherapist, speech therapist and occupational therapist.

Case Study 5.3

Background

- Sam is 8 years old.
- He is an only child and lives with his mother.

HPC

Sam has long-standing problems:

- He finds it difficult to make friends and often plays alone.
- He lacks confidence and has low self esteem.
- He cannot stay still and is constantly on the move and restless.
- He dislikes loud noises and often covers his ears with his hands.
- He dislikes the labels in clothes and his mother has to cut them all out.
- He hates having his hair cut.
- He continues to have difficulty with buttons and zips.
- He cannot ride a bike without stabilisers and avoids playing football or most other sport.
- He is a messy eater and is always knocking over his drink.
- He often has bruises on his shins and knees from knocking into things and falls.
- He complains of being tired but has trouble falling asleep.

School

- Sam attends mainstream primary school.
- He is a loner and does not join in the playground games.
- His teacher is concerned about the quality of his writing and lack of focus.
- He hates PE and is always the last one to change into his PE kit.
- He is poor at ball games.
- His teacher discusses her concerns with Sam's mother and requests an assessment by the educational psychologist.
- Sam is placed on the School Action Plus stage of the Special Educational Needs process by the school Special Educational Needs Coordinator (SENCO) and he is given extra help at school.
- The class teaching assistant (TA) is allocated time with him.

Assessment

- Sam's mother took him to see their GP who referred him to a paediatrician.
- The paediatrican excluded other conditions and diagnosed developmental co-ordination disorder (DCD).
- The paediatrican referred Sam to the joint physiotherapy and occupational therapy (OT) service for children with DCD.
- Sam's mother and school are asked to complete questionnaires to identify his main problems and strengths to make it possible to determine which services should see him for the initial assessment.
- It is decided that he should be offered an appointment with both a physiotherapist and occupational therapist. This way repetition of both the subjective and objective part of the assessment can be avoided and Sam only needs to attend one appointment.
- After discussion with his mother, Sam is offered an appointment first thing in the morning so that he missed as little school as possible but is not too tired.
- The assessment is carried out in the local community hospital where the room is spacious, child-orientated and close to home.
- The time is used efficiently; during part of the assessment one of the therapists will be working with Sam while the other is talking to his mother. One therapist will ask Sam to perform certain tasks whilst the other writes down specific observations.
- The subjective history is taken from Sam as well as his mother including asking how he feels and what his interests, likes and dislikes are.
- Both standardised and non-standardised assessments are used including the Movement ABC, clinical observations and physical examination of his tone, strength and joint range.
- After the appointment the OT and physiotherapist score the ABC, compile a report including his strengths, weaknesses, recommendations, etc.
- Sam's problems are identified and include motor planning, sensory processing, hip and shoulder stability and eye–hand coordination.
- The physiotherapist also visits Sam at school to speak to school staff more about their

concerns and to observe Sam in a PE lesson.

Recommendations/outcome

- The assessment findings are explained to Sam's mother and school.
- A detailed written report is provided including recommendations, strategies, and advice for both home and school.
- Sam is offered an intensive exercise programme at the community hospital. He attends once a week for 6 weeks and works with 3 other children on activities complied by the OT and physiotherapist to address his problems.
- The group starts at 4 pm allowing him to attend after school and lasts one hour.
- The children are asked to participate in planning activities to do each week.
- At the group he works on improving his gross motor coordination.
- He has exercises to practice at home in between group sessions.
- Sam's mother is invited to a parent workshop to explain and discuss DCD.
- School are invited to a DCD workshop as they are keen to run small group activities for several children and welcome strategies that can be effective in a classroom.
- School purchase a few small items of equipment to help improve his posture and position while he works.
- Following the conclusion of the group Sam is given a certificate for all his hard work – he takes it in to school and he is congratulated in assembly by the whole school.
- Sam is given information about local sports groups that will continue to enable him to generalise the progress he has made in an enjoyable and sociable setting. Sam chooses the one he wants.
- School continue with the strategies that help Sam and set an appropriate individual educational plan (IEP) that is reviewed termly.

Chapter 5 Community paediatrics multiple choice questions

1. Which of the following is a measurement of hip subluxation/dislocation?
    a). Cobb angle
    b). Migration percentage
    c). Acetabular angle
    d). Migration angle
2. Which of the following would not be appropriate for treating a child with spastic quadriplegia?
    a). 24-hour postural management
    b). Constraint-induced movement therapy
    c). Hippotherapy
    d). Aquatherapy
3. How long did Tardieu et al suggest that soleus must be stretched each day to prevent contracture (Tardieu et al 1988)?

a). 20 minutes
b). 1–2 hours
c). 4–6 hours
d). 6 hours plus

4. Which of the following are considered as a child's rights by the United Nations?
   i. The right to play and rest
   ii The right to special education and care if they have a disability and to live a full life
   iii The right to give your opinion, and for adults to listen and take it seriously
   iv The right to privacy
      a). all of the above
      b). ii and iii
      c). ii, iii and iv
      d). i, ii and iii
5. How long does the chemical effect of intramuscular botulinum toxin last?
   a). 1 week
   b). 1–2 months
   c). 2–4 months
   d). 6 months
6. Specialist footwear may be useful for a young child presenting with:
   a). Spasticity in their calf muscles and a passive range of −5° dorsiflexion with knee extension
   b). Ankle instability in standing and delayed walking
   c). Pronation of their feet in standing
   d). In-toeing during gait
7. During assessment it is important to ask about achievement of normal developmental milestones because
   a). Missing out a stage of normal development, such as crawling, can influence the child's gross motor ability
   b). It will explain how much the child was stimulated whilst he/she was young
   c). If the child did not achieve a specific stage, e.g. crawling, then that is the activity that should be worked on during physiotherapy sessions
   d). The parents will feel that the assessment is thorough
8. In normal development an infant is most likely to achieve independent sitting at approximately
   a). 4 months
   b). 6 months
   c). 10 months
   d). 12 months
9. A newborn full-term baby will adopt the following posture when laid in prone
   a). Takes weight through forearms and lifts its head up
   b). Head to one side and legs extended
   c). Head to one side and knees under abdomen

d). Lies with only abdomen on floor with limbs and head extended

10. By the age of 3, in normal development, a child should be able to
    a). Hop
    b). Ride a two-wheeled bicycle
    c). Walk up and down stairs independently, one foot per stair
    d). Run and kick a ball
11. Children with Duchenne muscular dystrophy are likely to develop contractures in which of the following:
    a). Shoulder flexors and hip flexors
    b). Knee extensors and elbow flexors
    c). Ankle plantar flexors and hip flexors
    d). Hip flexors and knee flexors
12. Which of the following is most likely to lead to delayed development in a child?
    a). Poor vocalisation
    b). Severe hypertonia
    c). Profound blindness or deafness
    d). All of the above
13. Which of the following is unlikely to reduce the risk of injury to the therapist when they treat a child?
    a). A variable height plinth
    b). Kneeling down to treat a child
    c). Using a wheeled stool
    d). Having someone assist the application of treatment
14. Which of the following would not be applicable during the assessment of a child?
    a). Any complications during pregnancy
    b). Apgar score at birth
    c). Identifying the parent's main concerns
    d). Score from SF-36
15. Which of the following are signs of underlying respiratory issues?
    a). Child is irritable
    b). Lip colour
    c). Flaring nostrils
    d). All of the above
16. Which of the following represents the normal heart beat for a child aged between 1 and 2
    a). 60–100 per minute
    b). 100–200 per minute
    c). 100–150 per minute
    d). 70–100 per minute
17. How many respiratory cycles would you expect a child aged 5–12 years to complete in a minute?
    a). 12

b). 30–40
c). 20–25
d). 25–35

18. Which of the following should be of immediate concern to a physiotherapist?
    a). Wheezing
    b). Productive cough
    c). Child failing to answer questions
    d). Grunting
19. A statement of special educational needs outlines which of the following
    a). The programme of physiotherapy that the child will receive
    b). The level of support a child requires at school to reach their potential
    c). The risk assessments associated with the clinical management of a child in their school
    d). All of the above
20. Which of the following is not a developmental milestone that is regularly assessed?
    a). Smiling
    b). Crawling
    c). Blowing out candles on a birthday cake
    d). Standing

Community paediatrics multiple choice answers

1. b)
2. b)
3. d)
4. a)
5. c)
6. b)
7. a)
8. b)
9. c)
10. d)
11. c)
12. d)
13. b)
14. d)
15. d)
16. c)
17. c)
18. d)
19. b)
20. c)

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Chapter 6

Community Physiotherapy

Introduction

Treatment techniques/management approach

- For any treatment, as for assessment, there is the additional focus on improving function related to the patient's needs and their environment.
- The intervention can take place in a variety of settings, from privately owned or rented property, Council or Housing Association accommodation, supported housing (sheltered or special sheltered), a caravan, hostel, Residential/Nursing Home or Day Centre.

Patient choice and rights

- Careful consideration must be given to:
  - the patient's choice DH (2001a)
  - culture CRE (2002)
  - privacy, dignity, confidentiality DH (2003) (including never leaving messages on answer-phones without the patient's permission).

Risk assessments

- Risk assessments should be carried out at the start of each treatment session as the environment may have changed since the previous visit. Risk assessment CSP (2002). Personal safety CSP (2009) (for the physiotherapist and the patient), Lone working CSP (2009).
- There will quite possibly not be any height-adjustable furniture or space for large pieces of equipment in the home environment. There could be environmental constraints when treatments take place in confined and cluttered areas, some of which may be unkempt or unclean.
- It may be difficult or impossible for a patient to manoeuvre, if they are becoming more dependent on a walking aid.
- Therefore, the environment may directly affect the choice of treatment. Moving and

handling CSP (2009).

Consent

- Where consent is required for involvement with carers, either formal (through an agency) or informal (family and friends) this must be clarified in the treatment process (CSP, 2004; DH, 2001a,b,c; DH 2009).
- The involvement can be supporting the treatment regime through assistance with moving and handling, reinforcing exercise programmes, assisting with communication or helping to understand any cultural issues.
- Patients with a high level of anxiety can often be reassured by people who are familiar to them, especially when a physiotherapist is introducing alternative approaches to treatment or new activities.

Holistic assessment and treatment

- All patients should be assessed and treated holistically with functional treatments aimed at improving their independence, safety and quality of life.
- Assessment may have identified a need to involve other professionals in the treatment process and joint visits may be of benefit to the patients and physiotherapist.
- Treatment programmes or activities should always involve a good understanding of the rehabilitation ethos of enabling and handing over responsibility to the patient, wherever possible.
- If an assessment has highlighted a particular functional activity that the patient is unable to carry out independently or safely, the choice of treatment should be focussed on addressing this.
- As an example, toileting in the acute setting may require a patient to walk 10 or more metres on an uncarpeted floor to reach a toilet with adequate lighting and assistance if required.
- When this activity is attempted at home, a similar distance is likely to involve walking on different floor coverings, through doorways and in potentially poor lighting, so provision of a commode by the bed at night would improve patient safety.
- Practise getting out of bed, arranging their clothes, cleaning themselves and getting back into bed.
- To be able to go to the toilet safely and independently at night contributes greatly to an individual's quality of life and dignity and involves the coordinated action of different muscle groups, strength, balance, adequate range of movement and confidence to perform the task.
- There may also need to be provision of equipment for bed mobility to facilitate these activities.
- Another example of a functional activity would involve accessing a drink. In the acute

setting, this is usually provided by staff. In the home setting a patient will need to plan how this is going to take place.

- The task will involve mobility, balance whilst multi-tasking, manual dexterity and transportation of the drink.
- This would apply to people of all ages and advice and exercises to address these activities should be incorporated into treatment programmes.
- Problem solving of the transportation for someone using a walking aid may include provision of a kitchen trolley or advising the use of a pocketed apron or shoulder bag in which to hold a bottle of liquid.

Pain management

- Treatments may involve the need for pain control, increasing range of movement, muscle strength, training on safe positioning, provision of appropriate equipment, improving balance and safety instructions.
- Repetition of activities may address some of these issues and can be carried out under the supervision of a delegated rehabilitation assistant or alternative carer.
- Treatments involving electrical and other equipment may be limited by the mode of transport used to travel to a patient and the environment of the patient.
- However, treatments can be carried out where appropriate using any of the following in the community: transcutaneous electrical nerve stimulator (TENS), portable ultrasound machine, pulse oximeter, interferential therapy, acupuncture, gym balls, Thera-Band and cuff weights for ankles and wrists.

Documentation

- All treatment interventions, conversations (with patients, formal and informal carers, family, friends and other colleagues and health professionals), giving advice and information must be carefully and accurately documented.
- If a patient chooses not to take your advice for whatever reason, this must also be documented (CSP, 2000).

Treatments specific to the speciality area

- The community is a speciality area using core skills that are enhanced by other specialities and skills specific to the environment.
- It should be recognised that it is not always possible to carry out a 'traditional' style of physiotherapy treatment and this may depend on the needs of a particular patient at a particular time in their unique setting.
- Invariably the treatment will involve problem-solving skills, using initiative, common

sense and flexibility in approach.

- The physiotherapist may find that they are using a whole set of skills, apart from physiotherapy, as the treatment will be holistic and not just medical.
- The physiotherapist may need to draw on knowledge relating to other issues affecting the patient, for example, difficulty in accessing housing or other benefits, the involvement of young carers, may be of great concern to someone and until resolved, they may not be able to engage fully with their treatment plans.
- Following an assessment, the treatment will always take into consideration the specific abilities and needs of the patient.
- SMART goals will be agreed jointly between the physiotherapist and the patient (DH, 2001a).

Activities of daily living (ADL)

- The necessity or desire to perform functional activities of daily living will need to be addressed in the treatment plans.
- It is important to understand the daily routine of the patient and discover what it is reasonable to achieve.
- This may include:
  - getting in and out of bed
  - using the toilet
  - getting washed and dressed
  - managing to self-medicate
  - getting on and off a chair
  - preparing a meal/hot drink
  - indoor and outdoor stair ascending/descending
  - outdoor mobility over rough terrain and slopes
  - tending the garden and other hobbies
  - going to work
  - going to the shops and/or post office
  - using an ATM at a bank
  - using public transport
  - getting in and out of a car
  - attending social activities
  - visiting friends and family.

Patient confidentiality

- There are confidentiality issues if relatives, friends or neighbours are present.
- Just because a person is receiving their physiotherapy treatment within their own home does not alter the fact that they may not want anybody else present.

- Even if the neighbour is also their main carer, this does not automatically mean they are entitled to be present or contribute to the treatment session in any way, nor are they entitled to any information about the patient or their progress after a treatment session, unless the express permission to allow this has been given by the patient.
- Partners are also not automatically entitled to any information just because of their marital status (DH, 2003).

Cultural considerations

- Respect has to be given to cultural and religious beliefs in someone's own home, but expectations of the patient should not compromise the physiotherapist's rights, for example, taking off your shoes in someone's house.
- Is there a way to reach a compromise, maybe by covering your shoes with an acceptable material?

Treatments related to specific areas of the home

- It is important to look at the home as the treatment/rehabilitation base.
- Treatment should always be functional and when related to daily living and activities it will encourage more compliance and ongoing adherence to the treatment plan.
- The advantage of treating someone in their home environment is that it gives the patient an opportunity to talk about their condition/s and about any concerns that they may have and how to manage them, or any other related questions.
- It may be that the physiotherapist will not be able to 'cure' the problem, but will be able to talk through or demonstrate effective ways to manage it.
- Advice based on this information will provide lifelong benefits to the patient.
- The physiotherapist is a great source of information and knowledge to the patient and should ensure that relevant written resources are provided (these are often available from self-help groups and charities or from the internet).
- In each area of the home, it is necessary to consider:
  - The environment
  - Functional treatments in each area, incorporating safe use of fixtures and fittings and problem solving
  - Adaptive equipment/exercises, to enable the patient to use everyday objects within the home
  - Involvement of other agencies, professionals, informal and formal carers.
- There are some issues that need to considered during treatments in all areas, such as appropriate footwear, the potential use of assistive technology (including the use of a pendant alarm) and personal safety issues (for the physiotherapist, rehabilitation

assistant or support worker, the patient and the carers).

- Patients should be encouraged to utilise as much of their environment as is possible to do safely and should resist the temptation to remain static, with the expectation that everything will be done for them (DH, 2001a).
- The community physiotherapist's work is fundamentally functional, therefore it is important to incorporate the patient's daily routine into the treatment plan. Therefore, a good place to start would be.

The Bedroom (upstairs or downstairs) (Figure 6.1)

Environmental considerations

- How much furniture or clutter is in the room? Are these forming obstacles? Can they be moved and re-positioned to improve the ability of the patient to mobilise and therefore reduce risk, if the patient agrees?
- Are there rugs or cables across the floor? Is it possible to tape down loose wiring and carpet edges and remove rugs, if the patient agrees? Can this be carried out by family members or the voluntary sector? Advise on risks, if the patient is unwilling or unable to adopt safer options.
- Is there adequate lighting/heating/ventilation (LHV)? Advise the patient to use a light if they need to get in and out of bed at night. When advising about the use of heating in the bedroom, it is an Act of Law that there should not be a working gas fire in a room where someone is sleeping unless it is a room-sealed appliance or it incorporates a safety control that will shut down the appliance to prevent a build up of combustible gas in the room concerned (GSR 1998 and HSE 1998).
- Bed is not always height adjustable or as firm as the conventional physiotherapy plinth. The bed that is in situ may be the only option available to you that can be used as the place to do exercises for limbs, trunk, balance, posture and to practice sitting to standing and standing to sitting.
- Consider joint visits with or referral to an occupational therapist (OT). However, this may involve different time scales depending on whether there is an occupational therapist in your team or access to a 'Trusted Assessor' (a physiotherapist, nurse or support worker who, when trained, will be able to assess for and prescribe a simple solution or a basic piece of equipment to meet the needs of an individual) available. It may be necessary to make a referral to an OT in Social Services.
- A patient may have started to use a commode or walking aid that prevents safe access to the side of the bed on which they usually sleep. In this case if the patient has accessed the bed in a specific way that is no longer possible, then an alternative method has to be developed and practiced to ensure the patient is able to get onto and off the bed safely.
- Advise on appropriate footwear and where it is safely accessible.
- Remind the patient to put on their pendant alarm, if they use one, before getting out of bed.

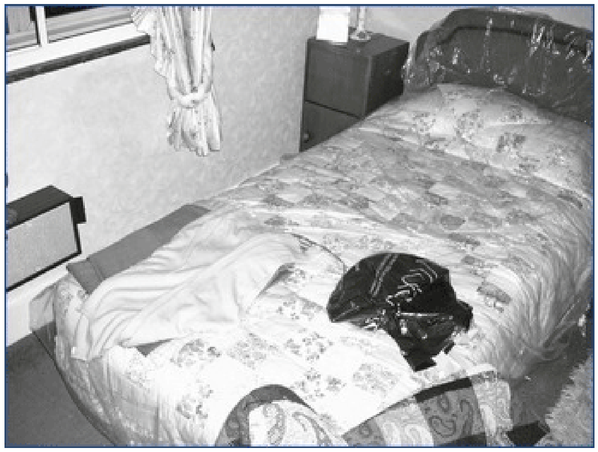

Figure 6.1 The bed area.

Functional treatments

- Bed mobility:
  - Patients with decreased mobility often find it difficult to move into a safe position in bed, especially if the mattress is soft or upper limb and trunk strength is reduced
  - If there are no contraindications for a patient to be to turning onto their side or into prone lying in bed but ability to get into these positions has been reduced, treatment would involve showing them how to roll over or move to the edge or centre of the bed by bridging
  - Techniques can be shown to carry out these activities and reminders given that first thing in the morning their joints/muscles may feel less flexible until their analgesia is effective
  - Sitting up over the side of the bed using the correct technique may be facilitated by the use of equipment if they have sufficient upper limb strength.
- Transitional activities:
  - It is important to teach or reinforce the correct techniques for lying to sitting and sitting to standing and these should be used as life-long methods
  - They should be demonstrated and practised with informal carers to avoid carer strain as patients often have unreasonable expectations of how their informal carers should assist them
  - It may be necessary to consider a mattress variator or profiling bed if therapy has not enabled the patient to manage by any other means
  - It is important to measure the compressed bed height (that is, when the patient is sitting on the side of the bed) before recommendation and provision of equipment.
- Transfers:
  - If a commode is being used, it will be necessary to practise the technique for getting out of bed and onto the commode and also getting off the commode and back into bed safely

  - A commode always needs to be positioned appropriately against a solid, static object.
- Exercise:
  - Patients can use the bed for exercise at any time during the day
  - After lunch, rather than falling asleep in the chair, it is worth encouraging patients to have 'siesta time' lying on the bed
  - This positioning can maintain joint range and prevent potential postural deformities that may lead to contractures
  - It also has the added benefit of reducing damage to pressure areas from constantly sitting and assists venous return and the reduction of dependent oedema
  - Patients should be made aware that this is not an indulgence, but a way of maintaining energy levels during the day.

Adaptive equipment/exercises

- To assist the physiotherapist to adapt to this different working environment, the following will provide suggestions of alternatives to the equipment more commonly encountered in a hospital/clinic setting.
- Physiotherapists will find that they have to be creative and adaptable within a community environment, often using available resources such as:
  - Sliding board – using an upturned tea tray, plastic bags or black bin liners
  - Wall bars – utilising a headboard to attach the Thera-Band to
  - Treatment roll – use towel rolled up in an old stocking or tied with string
  - Walking stick – for double arm stretches in lying or sitting.

Involvement of other agencies and informal carers

- An equipment assessment with an occupational therapist could facilitate the treatments and personal activities of daily living with provision of bed equipment, bed raises or a commode.
- A community nurse can order a specialist bed, if required for nursing management, such as a height-adjustable/profiling bed with a pressure relieving mattress.
- The informal carers should be involved in the treatment process (with the patient's consent) and shown specific techniques to avoid carer strain, such as using sliding sheets.
- Suppliers of assistive technology such as a pressure pad on the floor that switches the light on when the patient stands on it.

The bathroom and toilet (Figure 6.2)

- If it is a goal, the patient will expect to access the bathroom; however, not all patients need to access the bathroom to wash as they may just use a bowl in another room.

Figure 6.2 Access to the bathroom.

Environmental considerations

- What type of floor covering and what state of repair is it in?
- Ensure floor coverings are safe, i.e. not loose or slippery.
- Are there any obstacles?
- Can they be moved and re-positioned to reduce risk, if the patient agrees?
- Is there adequate LHV?
- Ensure lighting is accessible and sufficient, especially if the patient needs to move around the home at night.
- Is there already equipment in situ and is it appropriate and safe for purpose.
- Advise on use or misuse of fittings already in situ, e.g. it may be possible to pull up from the toilet using a secure towel rail, but not using the toilet roll holder.
- Always advise against using a radiator to pull up on as this could lead to burns. Consider a joint visit with an OT or referral to an OT in a community or Social Services team.
- Is there sufficient access through the doorway for a walking aid?
- Is there room for a walking aid inside the bathroom/toilet?
- Is there floor space for equipment if needed, e.g. a perching stool?
- Is there space for a carer to be present?
- Does the patient become short of breath performing certain personal care activities? If appropriate, a perching stool or another suitable item of equipment can be supplied.
- If a pendant alarm is used, remind patient to always replace it around their neck after washing.

Functional treatments

- Transfers:
  - A treatment goal may include getting on or off the toilet
  - The patient should practise sitting to standing and standing to sitting using the correct technique

– Appropriateness of equipment needs to be considered
– A toilet seat raise may not be acceptable if it is impractical to remove and replace if other family members need to access the toilet Alternatives are available. (Figure 6.3).

- Personal care activities:
  – Functional activities can be used to increase range of movement and muscle strength, to enable the patient to wash and dry themself, dress and undress themself, turn taps on and off and use the toilet
  – Personal care activities may also be carried out in the bedroom or kitchen if this is more appropriate.
- Balance exercises:
  – To ensure the patient is safe to perform activities in sitting and standing
  – It may be necessary to alter their sitting postures to wipe after using the toilet and/or to maintain an unsupported stand whilst washing and dressing and cleaning after using the toilet.
- Bath mobility:
  – This could be either stepping into the bath to shower or sitting on the bottom of the bath or getting on and off a bath board
  – The assessment will have identified areas of weakness, safety and what equipment may be required
  – Exercises can be carried out to improve range of movement and muscle strength of the relevant joints and muscle groups
  – Appropriate equipment can be recommended or supplied, e.g. bath board, non-slip mat, grab rails, bath seat, tap turners
  – Patients need to be as independent as possible, as formal carers will not assist patients to get out of a bath and it is not advisable for family members to assist either.

Figure 6.3 Mowbray toilet.

Adaptive equipment/exercises

- Functional exercises/activities may involve:
  - Forearm pronation/supination and strengthening of grip by wringing out a flannel
  - Shoulder medial/lateral rotation and flexion/extension can be increased by drying the back with a towel
  - Trunk flexion/extension will occur when the patient dries their feet with a towel.

Involvement of other agencies and informal carers

- An equipment assessment with an occupational therapist could facilitate the treatment and personal activities of daily living through the provision of equipment, such as a toilet surround or bath board and grab rails (Figure 6.4).
- The informal carers should be involved in the treatment process (with the patient's consent) and shown specific techniques to avoid injuring themselves, with an emphasis on safety.
- Suppliers of assistive technology for example can be involved, to provide monitoring equipment to prevent the bath from overflowing, if the taps are left running.

Figure 6.4 Equipment and potential adaptations to a bathroom.

The stairs and hallway (Figure 6.5)

- This is a high risk area where additional handrails may need to be considered.
- The physiotherapist needs to be aware that a patient may be particularly anxious about using the stairs if they have fallen on them previously.

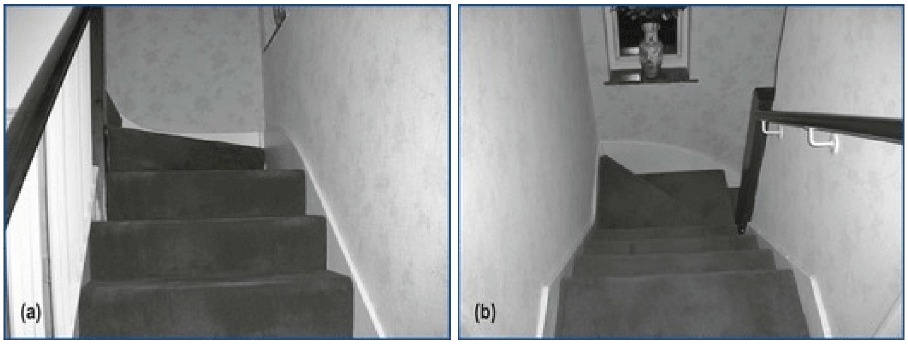

Figure 6.5 (a and b) stairs.

Environmental considerations

- How much furniture or clutter is in the hallway?
- Are there any obstacles? Can they be moved and re-positioned to reduce risk, if the patient agrees?
- Are there rugs or cables across the floor or stairs?
- Is the floor covering loose, worn or slippery? Is it possible to tape down loose wiring and carpet edges and remove rugs, if the patient agrees? Can this be carried out by family members or the voluntary sector?
- Advise on risks if unable to adopt safer options.
- Is there adequate LHV? Ensure lighting is accessible and sufficient.
- Are there already handrails in situ? Are they in the right positions and safe to use? If not and it is appropriate, measure for handrails or refer to an occupational therapist.
- Consideration must be given to:
  - The ownership of the property (Is it privately owned or housing association or private landlord?). The owners or landlords may not wish to have handrails attached to the walls.
  - Are the walls sufficiently strong to support the attachment and use of handrails?
- Is the flight of stairs straight or does it go round a corner?
- If a patient suffers from shortness of breath or reduced muscle strength, it may be beneficial to locate a chair at the top or bottom of the stairs as a resting place.
- If a patient is using walking aids to mobilise, it is worth considering if they would benefit from having identical aids at the top and bottom of the stairs to avoid them needing to carry them on the stairs.
- Advise the informal carer on the safest way to assist the patient whilst negotiating the stairs. They should not push or pull the patient. Suggest where they can stand so both are safe.
- The patient may need advice on appropriate types of footwear to use on the stairs.
- If patient is unable to access the front door, consider referral for the fitting of a door entry system, if appropriate.

- Can the front door be accessed easily?
- Does it have a door chain or peephole fitted for personal safety? If not, these can be fitted privately or by the voluntary sector.
- Can the patient pick up the post? If not, it may be possible for someone to fit a collection box on the back of the front door or provide a Helping Hand with which to pick up letters.
- Is there a smoke alarm fitted and working? If not, this could be organised privately or arranged through the local Fire Service.

Functional treatments

- Ascending/descending stairs:
  - Advise on single step or reciprocal method
  - Demonstrate the correct techniques appropriate to the individual patient, using equipment and walking aids as appropriate.
- Walking practice:
  - The hallway is often the longest and least cluttered floor space in which to progress mobility.
- Exercise tolerance:
  - Patients who suffer with limited exercise tolerance can count the number of stairs they will need to climb for the whole flight and start with step ups on the bottom step to gauge their exercise tolerance
  - This avoids getting half way up the stairs before realising that the patient does not have the exercise tolerance to complete the flight
  - Gradually increase the number of step ups on the bottom step until the required number is achieved.

Adaptive equipment

- Wall bars:
  - Use stair spindles to increase shoulder elevation/flexion by reaching up the spindle and sliding the hand down the spindle
  - Also for hand grip/release exercises
  - Use stair spindles for the attachment of Thera-Band or for the use of pulleys.
- Steps:
  - Use the bottom step for foot placement, with foot positioned properly on the step
  - Use the bottom step for step-ups and dips for quads strength, with the newel post for support
  - Standing on the bottom step, the patient can lower their heels down to perform calf/heel stretches
  - Bottom stair can be used for step ups to ascertain the exercise tolerance needed to

complete a flight of stairs.

- Walking practice:
  - The hallway (with a chair in it) can be used for a measured walk, or Timed Up And Go (TUAG), if appropriate, as part of an outcome measure, possibly adapted (Mathias et al, 1986)
  - Raised strips at each doorway to practise stepping over and lifting the feet properly to avoid trips (Figure 6.6).
- General mobility and dexterity:
  - Use front door locks and the placing of a key in the lock along with the locking and releasing of high and low bolts for practising hand dexterity and strength, reaching ability and trunk flexion and extension
  - Practise front door opening and closing, to improve balance, muscle strength and co-ordination
  - Coat hooks can be used for hanging coats on to achieve trunk extension, shoulder elevation and flexion.

Figure 6.6 Steps, potential hazards for trips.

Involvement of other agencies and informal carers

- An equipment assessment with an occupational therapist could facilitate the treatments and personal activities of daily living by the provision of equipment such as hand rails and grab rails.
- The informal carers should be involved in the treatment process (with the patient's consent) and shown specific techniques to avoid carer strain, with an emphasis on safety.
- Voluntary organisations can be involved with fitting a mail collection box or a door chain and peephole to the front door.
- Fire service for installation of a smoke alarm.

- Local crime prevention officer for advice on personal safety.

The lounge and dining rooms

- This may be where the patient is living day and night, with the bed, chair, commode/urine bottle and other essential items all in one place (a microenvironment).
- This may be an optimum solution for independent living from the physiotherapist's point of view; it may not be what the patient wants.
- This is not a suitable arrangement for everyone as people can be self-conscious about maintaining their dignity with the presence of equipment related to personal use, especially if they have visitors.
- Also, shared living space with several generations may prove a hindrance to adapting the environment appropriately.

Environmental considerations

- How much furniture or clutter is there? Are there any obstacles? Can they be moved and repositioned to reduce risk, if the patient agrees?
- Are there rugs or cables across the floor? Is the floor covering loose, worn or slippery? Is it possible to tape down loose wiring and carpet edges and remove rugs, if the patient agrees?
- Can this be carried out by family members or the voluntary sector? Advise on risks if unable to adopt safer options.
- Is there adequate LHV? This is especially important as patients often spend the majority of their day (and possibly night) in this area.
- Does the gas fire need to be capped off? Remember there should not be a working gas fire in a room where someone is sleeping unless it is a room-sealed appliance or it incorporates a safety control that will shut down the appliance to prevent a build up of combustible gas in the room concerned (GSR, HSE, 1998).
- Is the patient sleeping in an armchair at night instead of going to bed?
- Discuss the option of a riser/recliner chair for patients who sleep in the armchair so that their legs can be elevated.
- Is there sufficient room to use walking aids? Supply appropriate walking aids that can be used safely.
- Many patients use the furniture in the lounge and dining room areas as a support ('furniture walking'). If this has been assessed as a safe method of mobility, there is no reason why it should not continue.
- Can the patient carry items from room to room? Discuss the option of safe transportation of items to and from the kitchen and other areas of the accommodation on the same floor level, providing the door thresholds are not raised, e.g. using a trolley or caddy.
- Is the height of the furniture (sofas/chairs) correct for safe use? Raise it if appropriate

and possible. If not, discuss an acceptable alternative.
- Can the patient open and close the curtains safely? This could be assisted by the provision of a simple piece of equipment such as a Helping Hand.
- Is it possible for the patient to independently operate the telephone, television and door entry?
- Always make sure the controls for these are within easy reach.

Functional treatments

- Sit to stand and stand to sit:
  - Reinforce correct techniques and use these as activities to increase muscle strength
  - Always check the compressed chair height (that is, when the patient is sitting on it) to ascertain the need for chair raises. If chair raises are not acceptable, the physiotherapist would have to work on techniques and strengthening exercises to improve the patient's ability to stand up from a lower height, e.g. upper and lower limb exercises in sitting and standing and weight transference and balance in sitting and standing
  - If the patient is unsafe in an unsupported stand position, a solid chair back, sideboard or dining table can be used as support, if it is safe to do so.

Adaptive equipment and exercises

- A chair is not just for sitting on!
- It can be used as a tool for exercising for the trunk, neck, upper and lower limbs.
- Leaning over the side of the chair on one side and then the other side, for trunk side flexion.
- Weights:
  - The upper limbs can be exercised by using plastic bottles filled with liquid/sand /lentils as weights or by using a walking stick held in both hands for bilateral stretches
  - The lower limbs can be exercised by using oven gloves with baked bean tins in or a bag of potatoes as weights
  - It is also possible to purchase weighted bracelets and anklets in sports shops.
- Towels:
  - An old scarf can be used to improve medial and lateral shoulder rotation by holding it behind the back and using a 'drying the back' action.
- Table:
  - At the dining table, polishing with a duster can improve shoulder range and mobility
  - Also use as a surface to carry out hand activities, such as using playing cards, to increase manual dexterity.
- Radio and television:

  - Rhythmical exercises can be performed to music on the radio or television
  - Advert breaks or programme changes on the radio or television can be used as a prompt to get up and walk or exercise.
- Patients should be encouraged to get out of their chairs and walk to the dining table for meals, if this was part of their previous routine.

Involvement of other agencies and informal carers

- An equipment assessment with an occupational therapist could facilitate the treatments and personal activities of daily living by the provision of equipment such as chair raises or a trolley.
- The informal carers should be involved in the treatment process (with the patient's consent) and shown specific techniques to avoid carer strain, with an emphasis on safety.

The kitchen

- Not all patients want or need to access the kitchen, as meals may be supplied for them by 'meals on wheels' or formal/informal carers.
- It may be appropriate to discuss the patient's appetite and nutritional needs.
- Some patients will have a treatment goal to prepare a hot drink and others to prepare a snack or meal (Figure 6.7).

Figure 6.7 Hot drink practice, preparation of equipment required.

Environmental considerations

- How much furniture or clutter is there? Are there any obstacles? Can they be moved and re-positioned to reduce risk, if the patient agrees?
- Are there rugs or cables across the floor? Is the floor covering loose, sticky, greasy or slippery?
- Is it possible to tape down loose wiring and carpet edges and remove rugs, if the patient agrees?
- Can this be carried out by family members or the voluntary sector?
- Advise on cleaning and risks if unable to adopt safer options.
- Is there adequate LHV? Lighting and ventilation are of particular importance in the kitchen.
- Is it safe and appropriate to use walking aids in the kitchen?
- Work tops in galley type kitchens often provide adequate support.
- Is there room for equipment such as a trolley or perching stool?
- Discuss option of equipment for safe transportation of items to and from the kitchen to other areas of the accommodation on the same floor level.
- Are the work surfaces the right height?
- Is there a step up or down into the kitchen area? Discuss grab rails.
- Does the cooker need to be capped off? This may be applicable for patients who have been assessed under the Mental Capacity Act 2005 as not having the mental capacity to manage the hazards associated with having to use a gas appliance.

Functional treatments

- Sit to stand and stand to sit:
  - Reinforce correct techniques and use these activities to increase muscle strength using a kitchen chair or perching stool.
- Practise upper and lower limb exercises in sitting or standing and weight transference and balance practice in standing.
- If the patient is unsafe in an unsupported stand position, the kitchen table and sink unit can be used as support, if it is safe to do so.

Adaptive equipment/exercises

- Exercises can be carried out in sitting at a table or perching at a work top.
- A perching stool can be a useful piece of equipment to help when undertaking domestic activities of daily living (DADLs).
- As the patient improves, the exercises can be progressed and carried out with them in standing.
- Sitting: assisted exercises:
  - Preparing vegetables can improve manual dexterity
  - A rolling pin can be held in both hands and used to assist bilateral shoulder

exercises into elevation and flexion
  - Opening cans, using the tin opener and unscrewing bottle tops to improve hand strength and dexterity
  - Washing up (including turning taps on and off and wringing out dishcloths) to improve manual dexterity
  - Weight transference/balance
  - Wiping or polishing work surfaces improves balance, and upper limb range of movement.
- Standing:
  - It is acceptable to use fixed worktops and the edge of the sink as support when mobilising, especially if a walking aid is more of an obstacle than a support in a confined area.
- Balance:
  - Weight transference using the sink or kitchen table for support. The patient can practise open and closed chain exercises
  - Reaching towards wall and base units to improve balance and shoulder range of movement, progressing to functional activity when safe
- Strengthening:
  - Moving items, tins, equipment or bags from one place to another safely to improve muscle strength
  - Complex coordinated movements
  - Using kitchen equipment such as pressing the cooker/oven ignition and stooping to check the gas has lit, if appropriate and safe to do so.

Involvement of other agencies and informal carers

- An equipment assessment with an occupational therapist could facilitate the treatments and domestic activities of daily living by the provision of equipment such as a trolley, tap turners, kettle tipper and adapted cutlery.
- Assistive technology to prevent misuse of the gas cooker and monitor frequency the fridge is accessed, where there are concerns about a patient's nutritional status.

The floor

- To reduce the fear of falling, patients should be given advice on causes and prevention of falls and contingency plans if it should happen, as part of a treatment plan (DH, 2001a).

Environmental considerations

- How much furniture or clutter is in the room? Are there any obstacles? Can they be moved and re-positioned to reduce risk, if the patient agrees?
- Are there rugs or cables across the floor? Is it possible to tape down loose wiring and carpet edges and remove rugs, if the patient agrees? Can this be carried out by family members or the voluntary sector? Advise on risks if unable to adopt safer options.
- Is there adequate LHV? Heating is important if a patient has fallen and is unable to summon assistance as hypothermia is one of the complications of a long-lie.

Additional considerations

- Has the patient been feeling unwell or had an infection?
- Make the patient aware that they may lose their balance more easily if they are feeling unwell or have had a recent infection or if they are very tired.
- Has there been a change of medication?
- Advise the patient that a change in some types of medication could affect their balance.
- Some medications can affect blood pressure leading to postural hypotension, so patients may feel 'dizzy'.on sitting up or standing up.
- Remind them that they will need to let this feeling pass and support themselves in standing before mobilising.
- This is particularly important if they have a tendency to get up quickly to answer the door fearing that the visitor will leave.
- Foot health needs to be considered, as many patients are unable to reach their feet, which then become neglected. Corns, ingrowing or very long toenails, calluses and ulcers can all cause pain and difficulty in mobilising. Referrals can be made to the podiatrist with the patient's consent.
- Are they wearing inappropriate footwear? Advice on footwear is important as ill-fitting (too loose or too tight) shoes and slippers can contribute to a fall.
- Have they had their eyes tested in the last year? Poor vision can contribute to a fall and many patients are unable to visit the opticians.
- If this is the case, some opticians can be contacted to visit at home or transport may be arranged to take a patient to the opticians.

Functional treatments

- The floor as a treatment area:
  - Use the floor as a treatment area although this will vary greatly in size or suitability, depending on location
  - Patients may have their own exercise mat, but a duvet/blanket can be used for exercise on the floor.
- They need to be taught the safest and easiest way to get down onto the floor using an appropriate technique.

- Some patients fall often with no diagnosed cause.
- These patients could benefit from:
  - Being taught how to 'backward chain' (i.e. Get up from the floor using a specific technique, providing they are unhurt)
  - Discussing the benefits of using a pendant alarm.
- Devise contingency plans, if they fall and are unable to get up from the floor, which could include:
  - Keeping a blanket, cushion and towel at a low level in different rooms that would be accessible from the floor and could be used respectively to either cover the patient (to avoid hypothermia) or to lie on top of (to prevent pressure sores developing) or to use as a pad (if the patient needs to pass urine whilst still on the floor) to increase comfort in the event of a long lie.
  - Informal carers should be shown how to assist a patient with 'backward chaining' but advised not to try and lift a patient from the floor unaided.

Adaptive equipment/exercises

- The floor is the equipment and the treatment area. It can be used for:
  - Balance work
  - throwing and catching exercises
  - Practising foot placement using the patterns on the floor coverings or laying ribbons, tape or sticks on the floor to step over
  - Multi directional stepping and other supervised, dynamic balance work
  - Improving confidence
  - Progression in the use of walking aids to walking independently across the floor, if appropriate.

Involvement of other agencies and informal carers

- Liaise with GP or community nurses if there are problems with medication or you suspect the patient may have an infection.
- Refer to the podiatrist, if appropriate and with the patient's knowledge and consent.
- Refer to an optician, if appropriate and with the patient's knowledge and consent.
- The informal carers should be involved in the treatment process (with the patient's consent) and shown specific techniques to avoid carer strain, with an emphasis on safety.
- Refer for supply of a pendant alarm, if the patient agrees.

The garden (front and back)

- Not all people live in accommodation that has a garden, but most will need to access their properties by the front path and front door.
- Some people have a garden that they do not need or want to access and others like to walk or sit in their gardens or even perform gardening activities, if they are safe and able to do so.
- Accessing the outside can often have a positive effect upon a patient’s mood, morale and progression of activities.
- Treatment goals can be set to achieve any of the above, if they are realistic.

Environmental considerations

- Is the access to the front/back door by one step,a flight of steps, or a slope?
- Are there rails/ grab rails already in situ? Are they appropriately positioned and safe to use?
- Recommend and refer for supply of safe and well-positioned rails and grab rails, if appropriate and if the patient/landlord consent.
- How rough is the terrain? Is the ground very uneven to walk on? Is there broken paving or are there mossy paths? (Figure 6.8)
- Is there somewhere to sit and rest in the garden?
- Are they alone when accessing the garden or will they have someone with them?
- Demonstrate and advise on how to access the garden. This may involve informal carers.

Figure 6.8 Steps and pathway in a garden at night in the rain.

Functional treatments

- Teach an exercise programme to increase joint range and muscle strength to enable the patient to access the garden.

- Practice with informal carers or rehabilitation assistants.
- Mobilise around the garden, recommending the safest and most practical walking aid, as appropriate.
- This may be different from the walking aid used indoors as the terrain may be uneven and rough.
- Advise the patient that different walking aids may have to be privately purchased for outdoor use.
- Facilitate gardening activities by referring to voluntary groups.

Adaptive equipment/exercises

- Putting rubbish in the bin is a functional activity to improve balance, co-ordination and strength.

Involvement of other agencies and informal carers

- Refer to the occupational therapist for the provision of outdoor rails.
- Refer to a voluntary organisation that assists patients to carry out gardening activities within their abilities.
- The informal carers should be involved in the treatment process (with the patient's consent) and shown specific techniques to avoid carer strain, with an emphasis on safety.

The big outdoors

- Not all patients will want to or need to go outside their property.
- However, this may be a very realistic treatment goal for patients who would like to and are able to resume a more active lifestyle.
- Some patients may be able to achieve a level of independence to allow them to manage their domestic, travel and financial arrangements themselves
- However, safety must be the over-riding consideration.

Environmental considerations

- Has an event occurred to cause the patient to lose confidence?
- The patient needs insight into the risks of being outdoors.
- Point out hazards that the patient may encounter, such as uneven ground, people bumping into them; the speed with which they need to cross a road, ability to assess the

speed of traffic, erratic bus movements that could cause a loss of balance.
- Very light or very dark conditions or sudden changes in light (especially for patients with visual impairments).
- Weather conditions especially extreme heat or cold, snow, ice, strong winds.
- Uneven terrain (on the patient's property and in the street).
- Need to negotiate steps, stairs, kerbs, slopes, etc.
- Can the patient communicate effectively to seek help?
- Will a different walking aid be required?
- Does the patient need to get in and out of a car?
- Does the patient want to use public transport (train, bus, etc.)
- Negotiating sensory surfaces at the edge of the kerb.
- Do they want to walk/travel a long distance?
- Will they be shopping, using an ATM, going to a friend's house, going to the pub?
- Will they return to work?

Functional treatments

- Patients may need an appropriate walking aid for outdoor use and advice on how to purchase one privately.
- Demonstrate and practise how to negotiate stairs, steps and slopes.
- If the physiotherapist is going to take a patient outside, the patient may need to have a contingency plan for communication, if they have lost confidence or have a communication problem.
- It may be necessary to practise a simulated conversation with a shopkeeper for example.
- If the patient will be using money, practise hand dexterity exercises
- Give a regime of exercises to help increase exercise tolerance.
- Give advice on fatigue management.
- Remind patients that whatever distance they travel, they will need to return.
- Encourage them to plan a route where they may be able to rest (on a bench or at a friend's house).
- Consider the size of a supermarket and how much walking that would involve.
- Arrange for family, carers or rehabilitation assistants to accompany the patient, either to give physical or moral support and encouragement.
- Practise getting in and out of a car, using the correct techniques for safety and to minimise risk.

Adaptive equipment/exercises

- Locate different height steps to practise stepping up and down.
- Slopes can be used to improve balance and muscle strength, both when ascending and descending.

- Use trees, lamp posts, etc. as markers to set goals and identify distances covered.
- Practise advanced balance exercises to prepare for a bus journey.
- Use a trolley as a support/walking aid in the supermarket.

Involvement of other agencies and informal carers

- Refer to the occupational therapist for potential aids and adaptations for use in the car.
- The informal carers should be involved in the treatment process (with the patient's consent) and shown specific techniques to avoid carer strain, with an emphasis on safety.
- Refer to 'Dial A Ride' to facilitate transport.
- Refer to voluntary organisations to accompany patient when they are mobilising outdoors.
- Access to a wheelchair for outdoor use over long distances will be dependent on local provision/services.
- Refer for the Blue Badge scheme, if appropriate (DOT, 2010).
- Physiotherapists may be consulted regarding the appropriateness of accommodation or the level of input needed to remain safe and supported (Figure 6.9).

Figure 6.9 Sheltered accommodation.

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The Chartered Society of Physiotherapy website www.csp.org.uk

National Institute for Health and Clinical Excellence (NICE) www.nice.org.uk/guidance documents

AGILE (Clinical Interest Group for Physiotherapists working with Older People).

Information leaflets

Outcome measures available from CSP website.

Outcomes database.

Handbook of functional assessment tools in rehabilitation and the internet http://www.agile-uk.org/

ACPC (Clinical Interest Group for Physiotherapists working in the community) publications. Development of evidence based practice in community settings.

Chapter 6

E-materials

Author profiles

Karen Rix GradDipPhys MCSP

Karen Rix is a Clinical Specialist Physiotherapist working in Croydon Community Health Services as Clinical Team Leader.

Karen has worked in the Community since 1982, 8 years of which have been in Intermediate Care gaining extensive experience of working in different community teams.

She is currently Chair of the Association of Chartered Physiotherapists in the Community and editor of Out & About, their quarterly Newsletter.

Maureen Carter

Maureen has a wealth of experience gained from working in the NHS and overseas in a variety of clinical specialities.

Since 1986 Maureen has worked in the Community setting, first in a domiciliary team and in the latter part of her career as part of an Intermediate Care team.

In addition to her clinical experience Maureen has worked extensively as a clinical educator providing support for students during placements in the primary care environment.

Maureen has held regional and national posts with AGILE and the ACPC.

Maureen retired officially in 2009, but as with contributing to this book she admits to being 'tempted back from time to time!'

Yvonne Wren GradDipPhys

Yvonne Wren retired from the NHS in 2008 after working as a physiotherapist for 35 years in south-east London. Initially specialising in stroke rehabilitation, the last 20 years she has worked in elder rehabilitation and in the community. Her last post was as the clinical therapy lead for intermediate care in Southwark, working within integrated services.

As an experienced clinical educator, Yvonne was approached by the link tutor at the University of East London and asked to become a specialist lecturer there for the community module of the physiotherapy degree course. In this role, she gave lectures and facilitated seminars at the university for the five years before she retired.

Appendix 6.1 Community resource file

Policies and procedures

The method of accessing these should be clearly identified on induction to the department.

The Community Therapy team should have easy access to local policies and procedures, either in electronic format via the intranet or as hard copy in folders (these must be regularly updated).

Up-to-date national guidelines and policies should also be available to staff and if access via a 'search engine' is not allowed then these should be available as hard copies in the department.

Sources of online guidelines and policies

www.csp.org.uk
www.dh.gov.uk
www.nice.org.uk/guidance

Local groups and services

This information is invaluable to the community physiotherapist and will have been collected by the team as a general resource. If not then maybe this can be a project for the next therapist on rotation or for a student's presentation.

Contact details for other community colleagues such as occupational therapists, podiatry, community dietetics, general community and specialist nursing teams, continence services, and community pharmacy services should be readily available.

The voluntary sector, charities and self-help groups are all essential for patients with long-term conditions to be managed effectively.

Online resources voluntary sector and self-help groups

www.nhs.uk/conditions
www.patient.co.uk
www.netdoctor.co.uk
www.ageuk.org.uk
www.carers.org
www.self-help.org.uk
www.charitiesdirectory.com

Assessment forms, outcome measures and exercise sheets

General and specialist assessment forms, a selection of appropriate outcome measures and a selection of printed exercise sheets are essential to standardise interventions between therapists. Leaving written information with the patient maximises the benefit of the intervention.

Specific treatment protocols requested by a referring consultant should be available for routine referrals or obtained individually if necessary.

It is essential that a physiotherapist is aware of these before visiting a patient.

Equipment

A community physiotherapist should have a panic alarm and mobile phone with preprogrammed essential contact numbers with them at all times.

It is also essential to be aware of any phone network black spots in their area.

Equipment such as walking frames should be delivered by the local equipment service, but small items such as crutches and walking sticks can safely be carried in the boot of a car.

Also helpful to be kept in the car is a small supply of different size ferrules, a tape measure, hacksaw and a spanner.

A torch and satellite navigation system, or at least a street map are also essential.

Other essential equipment such as a stethoscope, goniometer, tape measure and resuscitation mask need to be carried in an appropriate lockable bag that can be easily carried. The bag will also be needed for safe transportation of the patient notes, work diary and spare paperwork.

A copy of the BNF (British National Formulary) can be useful to identify medication during patient assessment.

Infection control equipment

Gloves, aprons, hand wash and paper towels, hand gel and protective goggles should be carried in the car.

Case Study 6.1

80-year-old lady (Mrs A) – fall in nursing home

Assessment begins on receipt of the referral from GP stating Mrs A fell 4 weeks ago, sustaining soft tissue injury around the right knee, but no fracture.

Past medical history

- Left hemiarthroplasty 2 years ago.
- Osteoarthritis in knee joints managed with analgesics.
- Congestive cardiac failure controlled by diuretics.
- Type II diabetes controlled by tablets.
- Difficulty mobilising independently and safely.

Social history

- Resident in a nursing home for past 6 months after having increasing difficulty coping at home.
- History of self-neglect.
- Recurrent urinary tract infections.
- Confusion.
- Frequent falls.
- Mobile with a frame and assistance/verbal prompting.

Subjective assessment

- Patient remembered tripping over her slippers when trying to reach her clothes.
- No apparent injury at the time.
- Right knee feels stiffer and more painful to walk on the next day.

Objective assessment (patient supine)

- Arthritic valgus deformity bilaterally in both knees.
- Right knee more swollen and tender.
- Pitting oedema bilaterally at ankles.
- Movement and muscle strength reduced in lower limb joints, particularly around right knee.
- Patient had difficulty rolling onto her side and sitting up in bed (staff always helped).
- Sitting balance good, dizzy initially.
- Needed assistance sit to stand, again felt dizzy, and needed frame for support in standing.
- Mobilised using the frame, with verbal prompting, to turn and sit safely.
- Became breathless after mobilising for 20 steps.

Outcome measure

Elderly Mobility Scale (Smith R 1994 Validation and reliability of the Elderly Mobility Scale. Physiotherapy 80:744–747).

Treatment plan

Assessment findings discussed and agreed with Mrs A.

The agreed goals were to:

1. Be able to walk without fear of falling
2. 'Get the knee moving again'
3. Be more independent.

It was discussed how this might be achieved, using SMART goals and involving the nursing home staff.

Plan

Problem 1 Reduced range of movement in right knee

- Teach patient and staff active knee flexion/extension exercises.
- Give staff written/diagrammatic instructions.
- Instruct staff how and when these exercises should be performed.

Problem 2 Reduced muscle strength in right knee

- Provide strengthening exercises for right knee.
- Give staff written/diagrammatic instructions.
- Instruct staff how and when these exercises should be performed.
- Teach correct technique for standing from sitting.
- Teach staff how to supervise safe standing technique.

Problem 3 Dizziness related to postural changes

- Staff to check lying/standing blood pressures until GP review.
- Staff to monitor blood glucose levels as agreed by diabetic nurse.
- Medication review by GP.
- Patient and staff advised on potential risk and not to carry out activities alone or too quickly.

Problem 4 Difficulty moving in bed

- Advise on methods of increasing bed mobility.
- Arrange for provision of bed lever.
- Decrease patient's level of dependence on nursing home staff.

Problem 5 Fear of falling

- Advise patient of causes and risks of falling and how to avoid them.
- Ensure appropriate footwear available.
- Discuss with patient how to be independent and safe.

Advise staff to

- Ensure patient's property, drinks and call bell are always within reach.

- Arrange an eye test if appropriate.
- Ensure regular podiatry visits take place.
- Ensure medication review takes place (Smith R 1994 Validation and reliability of the Elderly Mobility Scale. Physiotherapy 80:744–747).
- Make dietetic referral if necessary.
- Monitor condition and suitability of walking aid.

Intervention should be fully documented in physiotherapist's notes and patient record in the nursing home.

Contact information, return date and time to be left with patient and nurse in charge.

Case Study 6.2

76-year-old man (Mr B) – Parkinson's disease and UTI

Assessment begins on receipt of referral from GP stating Mr B had a UTI resulting in him 'going off his feet'.

Past medical history

- Parkinson's disease treated with dopamine.
- Hypertension controlled by betablockers.
- OA knees managed with analgesics.
- Constipation managed by regular laxatives.

Social history

- Lives with wife in three-bedroom house.
- Previously mobile indoors with no aid.
- No adaptations or equipment other than a second stair rail.
- Able to manage stairs.
- Toilet and bathroom upstairs also toilet on ground floor.
- Sleeps upstairs and wakes once or twice nightly to pass urine (keeps a urine bottle by bed).
- Usually independent with bed and chair transfers.
- Access involves a step front and rear.
- Sloping drive at the side of the house.
- Supervision/assistance outdoors.

- Assistance for car transfers.

Subjective assessment

- Lost confidence.
- Afraid of ‘freezing’ or knees giving way.
- Reluctant to get out of bed.
- Increased constipation from reduced mobility causing back pain and decreased appetite.
- Swallowing difficulties compromising his ability to eat, drink and take medication.
- Concerned with his high dependence on his wife.
- Concerned for his safety on the stairs.

Objective assessment (patient supine)

- Reduced active trunk movement due to rigidity and muscle weakness.
- Cog-wheeling in upper limbs.
- Tightness in elbow flexors.
- Fine resting tremor (pill rolling).
- Tight hamstrings, hip adductors and gastrocnemius/soleus.
- Required assistance for rolling, lying to sitting and sitting to standing.
- Flexed posture in lying, sitting and standing.
- Short shuffling steps with minimal trunk or arm movement.
- Unable to assess on stairs at initial visit.
- Difficulty accessing downstairs toilet.
- Anxiety around continence problems.
- Poor voice projection and difficulty clearing saliva.
- Functional ability and concentration varied with medication.

Outcome measures

- Timed unsupported steady stand.
- Elderly Mobility Scale.

Treatment plan

Assessment findings discussed and agreed with Mr B.

The agreed goals were to:

1. Use stairs again
2. Be less dependent on his wife

3. Be able to go out with his wife.

It was discussed how this might be achieved, using SMART goals and supported by his wife.

Plan

Problem 1 Reduced range of movement trunk and limbs

- Provide active exercises with written/diagrammatic instructions.
- Demonstrate these exercises and when they should be performed.
- Arrange for supervised sessions with support worker.

Problem 2 Difficulty with bed transfers and mobility

- Provision of equipment, e.g. walking and bed aids.
- Transfer practice with support worker.

Problem 3 Increased dependence on wife

- Advice to wife on offering appropriate level of support.
- Demonstrate how best to enable Mr B to carry out activities.
- Teach strategies to Mr B and wife to facilitate mobility.

Problem 4 Loss of confidence in ability to use stairs

- Assess on stairs and practise with support worker.
- Vary times of visits to assess how Mr B's ability fluctuates.
- Progress to outdoor mobility as function improves.

Onward referrals

- OT.
- SALT.
- GP.
- Carers' assessment.
- Benefits review.
- Local PD support group.
- Dietician.
- Podiatrist.

On discharge

- Review goals.
- Provide Mr B with maintenance regime.

Case Study 6.3

62-year-old lady (Mrs C) – COPD

- Assessment begins on receipt of referral to Intermediate Care from GP stating Mrs C has an infective exacerbation of her COPD.
- One week of treatment with antibiotics and steroids had not regained her previous level of function and she was unable to manage.
- She had been discharged 8 weeks previously and refused a further admission to hospital.

Past medical history

- COPD salbutamol nebuliser, Seretide inhaler, Spiriva inhaler.
- Osteoporosis with vertebral collapse Alendronate, Calcichew.

Social history

- Lives in first-floor private warden-controlled flat with lift.
- Widowed 5 years ago.
- Daughter lives 200 miles away.
- 20 pack year smoking history.
- Privately purchased 4-wheel walker with seat for indoor use.
- Wheelchair for social trips, etc.
- Prior to admission to hospital had been independent with PADLs, attended the lunch club, managed her own laundry and used the mini bus for shopping trips.
- On discharge from hospital had a twice daily care package for PADLs, a weekly housework and laundry call and lunch was sent up from the lunch club.

Subjective assessment

- Short of breath on exertion, cough producing thick green sputum.
- Low in mood and tired.
- Unable to tolerate sleeping in her bed, so using the recliner chair.

- Increased SOB had prevented her from participating with carer in her washing and dressing for the past week.
- Stress incontinence and frequency. Bowels not opened for 2 days.
- Loss of appetite, warden calling in to provide hot drinks and emotional support.

Objective assessment

- Using accessory muscles and pursed lip breathing.
- Unable to speak in complete sentences. O_2 sats 88% on air.
- Finger clubbing and ankle oedema.
- Mild kyphotic deformity with ↓ ROM in trunk and upper limbs.
- Unable to perform unsupported arm movements when asked to comb hair.
- Generally deconditioned, muscle wasting quads and gluts.

Outcome measures

- Modified Borg scale.
- Self efficacy scale.
- London chest ADL scale.

Treatment plan

Assessment findings discussed and agreed with Mrs C.

The agreed goals were to:

1. Learn coping strategies.
2. Return to sleeping in a bed.
3. Be independent of carers.
4. Be able to return to lunch club.
5. Resume weekly supermarket shopping trips.

Problem 1 Coping with long-term condition

- Effective use of inhalers.
- Emergency antibiotics/steroids for early treatment of exacerbations.
- Breathing control/relaxation techniques.
- Awareness of good nutritional balance/weight management.
- Continence advice.
- Maintenance of social and support network.
- Access to respiratory nurse (if appropriate).

Problem 2 Unable to sleep in bed

- Advice on positioning, pillows, etc.
- Commode for use by bed at night.
- Teach energy-saving techniques for getting in/out of bed.
- OT assessment for equipment.

Problem 3 Independent washing and dressing

- Advice on energy conservation techniques.
- Advice on supported arm function.
- Use of equipment, perching stool, long-handled washing and dressing aids, etc.

Problem 4 Unable to mobilise to lunch club

- Regime of progressive exercises to increase exercise tolerance.
- Use of seat on wheeled walker to rest at intervals.
- Advise on continence management.

Problem 5 Unable to do weekly shopping trip

- Increase exercise tolerance indoors.
- Practise supervised outdoor access.
- Practise steps and curbs.
- Practise accessing minibus.
- Advise on benefit of using supermarket trolley to reduce effort.

Onward referrals

- Respiratory nurse specialist.
- Pulmonary rehabilitation group/Respiratory support/Breathe Easy group.
- Dietician.
- Continence Service.
- Podiatrist.

Chapter 6 Community multiple choice questions

1. A new referral arrives in the office. Do you:
    a). Contact patient and referrer to acknowledge referral?
    b). Assess level of urgency and place referral on the pending list?
    c). Check referral for level of information and contact referrer if this is inadequate to prioritise?

d). Leave on desk to deal with later?

2. You are visiting a new patient. Do you:
   a). Contact patient to arrange appointment time, check details, location and means of access?
   b). Turn up without prior arrangement as you are in the area and have a "space"?
   c). Explain who you are and the nature of your service with information material?
   d). Show your identification to patient?
3. There is no free parking near the patient's home. Do you:
   a). Use parking permit as specified?
   b). Use metered parking with payment?
   c). Park on or across neighbour's driveway, leaving address details on dashboard?
   d). Abandon visit?
4. You are late finishing at the end of the day. Do you:
   a). Contact base to inform you have finished and be signed out?
   b). Contact colleague to confirm you have finished?
   c). Drive home as no one else will be working still?
   d). Ask patient to inform base that you have left if they call?
5. You have all the patient notes for your day's visits. Do you:
   a). Keep notes locked in boot?
   b). Keep them with you in a slip folder?
   c). Keep them with you in a locked briefcase?
   d). Leave them on the car seat?
6. Your patient has difficulty transferring and her husband is lifting her. Do you:
   a). Let him continue as this is their routine?
   b). Introduce hoist and carers?
   c). Assess how much the patient is able to do?
   d). Demonstrate an alternative and let patient and carer try for themselves?
7. You have assessed your patient's ability to answer questions and consider them able to provide valid information, but their relative/carer answers your questions for the patient. Do you:
   a). Let them continue as they know the situation?
   b). Explain to relative/carer that the initial information needs to come from the patient?
   c). Ask relative/carer to move to another room?
   d). With patient's consent corroborate information from relative/carer?
8. You feel it is essential your patient has further investigation/intervention. Do you:
   a). Refer on and inform patient once arranged?
   b). Discuss with patient explaining why you feel the referral is required, then refer on?
   c). Refer on without informing patient as they might refuse?
   d). Inform referrer and suspend treatment?
9. You are referred a patient with a history of alcohol abuse. Do you:
   a). Visit to assess the situation?

b). Check with GP/referrer how major an issue this is and potential risk?
c). Carry out a joint visit to assess if intervention is appropriate?
d). Decline to visit?

10. You visit a patient and they or a family member are verbally abusive. Do you:
    a). Continue the visit ignoring the abuse?
    b). Leave, giving the reason you will not tolerate such abuse?
    c). Leave on the pretext of getting something from the car?
    d). Try to reason with the patient/relative over a cup of tea?
11. Your team member reports a patient has been increasingly verbally abusive during a series of visits, but you have not experienced this. Do you:
    a). Confront patient?
    b). Discuss with colleague indications of what prompts this behaviour and how they present themselves to patient?
    c). Carry out joint visit, yourself leading?
    d). Carry out a joint visit, colleague leading?
12. You are treating a stroke patient who has a further CVA with marked deterioration making it inappropriate to continue with your original programme. The patient expects you to continue as before. Do you:
    a). Carry on in an attempt to regain ground?
    b). Delay further treatment until appropriate investigations have been undertaken?
    c). Reset appropriate goals with patient and others involved with their rehab?
    d). Refer on to other services to meet his level of need?
13. You visit a patient in a nursing home and find them on the floor. Do you:
    a). Help staff to hoist patient onto bed/chair?
    b). Get them up on your own as the patient does not want any fuss?
    c). Ascertain if patient is injured and request the staff call emergency services?
    d). Document event in your NHS notes, Nursing Home notes and complete incident forms?
14. Your patient had a fall on their son's stairs and is now nervous of her own stairs. She is sleeping in an armchair downstairs. Do you:
    a). Refer to falls service depending on outcome of assessment?
    b). Assess on stairs for rails or other adaptations?
    c). Practise stairs with therapist and support workers until confidence returns?
    d). Arrange for bed to be brought downstairs?
15. After assessment you feel a patient would benefit from a walking aid, which they decline. Do you:
    a). Refuse to continue, as patient is non-compliant?
    b). Explain the reasons for your advice, the benefits of using it and encourage the patient to try the aid?
    c). Insist on them using the aid?
    d). Document patient's refusal to use the aid despite your advice and highlight any associated risks?

Chapter 7

Gerontology

Clinical reasoning and treatment choice based on assessment findings

- In principle, the same treatment techniques are used within older peoples' rehabilitation as are used with younger people.
- The physiotherapist may need to adapt the treatment techniques taking into account the older person's past medical history.
- More time should be given for learning exercises and practising skills.
- Assessment may identify multiple impairments that contribute to an older person's functional problem. For example: difficulty in standing up from a chair may be due to reduced muscle power, poor balance and painful joints. The physiotherapist can apply a range of interventions as part of the treatment plan to address each of these impairments, e.g. Exercise therapy, practice of the task and MSK treatment techniques to reduce pain.
- If the treatment plan proves only partially successful, then compensatory strategies may enhance the outcome of treatment. eg: raising the height of the chair to compensate for reduced muscle power.

General principles of exercise prescription

- Exercise prescription should include the frequency, duration, intensity and type of activity dependent upon the ability of the person.
- For all older people, exercise sessions should start with a gradual warm up and cool down.
- Pre-exercise assessment should include the older person's:
    - Health history
    - Functional abilities
    - Activity history
    - Current interests
    - Preferences
    - Social and economic needs
    - Motivation and readiness to exercise.
- Older people with existing medical conditions or those with a recent injurious fall,

without a medical assessment and those who are unsure about their safety during physical activity, should first consult an appropriately qualified health care professional, before embarking on a physical activity programme (DOH 2001a).

Physical activity guidelines

- The CMO (2011) guidance for physical activity in older adults recommends that:
  - Older adults should engage in 150 minutes of moderate intensity activity in bouts of 10 minutes or more over a week.
  - For those who are already regularly active at moderate intensity, 75 minutes of vigorous activity spread through the week is comparable.
  - Older adults should engage in physical activity that improves muscle strength on at least 2 days per week
  - Older adults at risk of falls should incorporate physical activity to improve balance and co-ordination at least 2 days per week.
  - Older adults should minimise the time they spend sitting for prolonged periods.
- The British Heart Foundation acknowledges that any activity is better than none at all, and (especially older) sedentary people should be encouraged to start at a level of activity with which they are comfortable.
- This may be as little as 5 minutes of activity to begin with, with the aim of gradually increasing in duration and intensity (British Heart Foundation 2008). Older people require clear messages about how much physical activity is beneficial for their health, but they also need reassurance that they are unlikely to over-exert themselves.
- The physiotherapist should educate the older person in the early recognition of symptoms that might indicate an exacerbation of a chronic problem, e.g. an increase in pain, swelling or stiffness of an osteoarthritic knee.

General treatment considerations

- Footwear:
  - Appropriate footwear is a key part of older peoples' rehabilitation.
  - Every effort must be made to bring the person's footwear into hospital.
  - Footwear may compensate for impairments, e.g. heel raise for leg length discrepancy.
  - An individual may be immobile until their footwear is available.
  - Foam disposable slippers are not suitable for older people who have balance/gait impairment as the soles tend to stick to the floor.
  - If the older person has significant swelling of the lower limbs ± bandages, a referral to surgical appliances may be required to assess for suitable long-term footwear.
- Continence:

- The older person may wish to use the toilet prior to a therapy session especially if they have urinary frequency.
- If the person has a catheter, remember to check that it is not too full and that it is secured to their leg.
- Do not let the older person carry the catheter bag at the hand grip of a walking aid (risk of back flow) and always think about the older person's dignity.
- Check that incontinence pads are securely in place prior to treatment.
- Try to keep a spare pair of gloves in your uniform pocket (infection control).

• Level of effort:
  - An older person's exercise tolerance is likely to be lower than a younger person.
  - However, it is essential that the patient works sufficiently hard during a physiotherapy session otherwise the treatment will be ineffective.
  - The person may need lots of rests while working towards their goals, but they also need lots of practice in order to achieve them.
  - Watch their work of breathing, as an indicator of exertion and ensure adequate rest/recovery periods with treatment.
  - Encourage the person to monitor their own level of effort by using a scale of 0–10 where sitting is 0 and 10 is all-out effort.
  - Aim for a level of 5 (moderate intensity) where the older person is still able to have a conversation but is breathing slightly harder.
  - Ensure that inhalers, GTN spray or other medication is readily at hand.

• Effects of bed rest:
  - Prior to moving from lying to sitting, ask the person to perform leg exercises to increase their circulatory flow.
  - Break down the bed transfer into stages.
  - Encourage the person to move slowly from lying to sitting over the edge of the bed.
  - Observe for signs of postural hypotension. Symptoms may include dizziness, light headedness, weakness and/or pain across the shoulders and neck.

• Carers:
  - Encourage relatives/carers to be involved in the rehabilitation programme and update them of progress made if the older person wishes.
  - Involving the carer early in rehabilitation ensures that there is ample opportunity to discuss concerns and plans for discharge.

• Personal autonomy:
  - There are few opportunities for choice when in hospital.
  - The physiotherapist should offer, where possible, choice, e.g. time of the treatment session or choice of at least two different activities during the treatment session that the older person wishes to work on.

• Declining treatment:
  - Listen to the person and spend time exploring the reasons behind the refusal.
  - There are many reasons that contribute to loss of confidence and reluctance to participate in rehabilitation.

- Reasons for reluctance to participate in treatment
  - Lack of practice and/or familiarity
  - Impairment, e.g. weakness, loss of sensation, pain, unsteadiness, tightness, stiffness, breathlessness
  - Beliefs about illness and/or condition
  - Anxiety, e.g. sense of loss of control over the body, sense of imminent disaster in specific circumstances such as a sense of knee giving way, loss of balance when not using a walking aid
  - Low perception of control
  - Low self-efficacy.
- Outcome measures
  - Choose the outcome measure that is valid, sensitive and specific to the person's needs.
  - Avoid using an outcome measure as an assessment tool; this can detract from assessing the specific impairments underlying the patient's functional problems.
  - Tables 7.1-7.6 provide examples of outcome measures that can be used for specific impairments.
- Treatment environments
  - Acute care rehabilitation is the start of the rehabilitation pathway for hospitalised patients with an acute illness or injury.
  - Patients may have less time to reach their rehabilitation goals while in acute care and risk being discharged as soon as they are able to cope at home rather than having the opportunity to achieve wider safety margins or developing reserves of coping ability.
  - A US study by Sager et al (1996) found that a third of elderly medical inpatients experienced a decline in function whilst in hospital, therefore efficient use must be made of the limited time in the acute care setting.
  - Brief but intensive rehabilitation programmes should be targeted at improving muscle strength, functional mobility and endurance in order to widen the patient's safe functional abilities.
  - Adequate practice opportunities throughout the day are crucial to achieving effective acute rehabilitation, e.g. delegating to physiotherapy assistants, working with nursing staff and health care assistants.
  - The importance of exercise provision is highlighted by a systematic review completed by de Morton et al (2007) that found multidisciplinary intervention including exercise improved patient and hospital outcomes for hospitalised older medical patients.
  - Regular liaison with the multidisciplinary team (MDT) regarding the estimated date of discharge (EDD) is essential so that the necessary assessments are carried out in a timely manner.
  - A useful question to consider is: 'Are the person's goals likely to be met before the EDD?'

– If the individual is making progress on a daily basis and is likely to reach their pre-morbid function at the same time as the EDD, consider referral to community services for further rehabilitation if indicated, e.g. day hospital or community physiotherapy.

– If the individual has experienced a significant change in their function, discuss the options for further rehabilitation in the community, e.g. bed-based community hospital or intermediate care with the patient and in collaboration with the MDT.

Table 7.1 Evaluating therapy interventions – balance

Outcome measure	**Reasoning**	**Testing tips**
Timed Unsupported Steady Standing (TUSS)	This is a simple test of static steady balance for frail older people (Simpson et al 1996).	The end point is 60 seconds. It can be made more challenging by assessing with feet together (TUSSTOG) and feet in tandem (TUSSTAN).
TURN 180	This is a staff-rated performance based test of dynamic postural stability when turning 180° (Simpson et al 2002, Fitzpatrick et al 2005).	It can also be used as a screening test for risk of falling. Taking 5 steps or more to TURN 180 increases the relative risk of falling in the following year by 1.9 in community dwelling older people (Nevitt et al 1989). The older person needs to be able to stand unsupported for one minute in order to perform the test. It is not appropriate for older people with weight bearing restrictions, pain, anxiety or severe confusion.
Berg Balance Scale	This is a scale designed to measure balance by assessing the performance of 14 functional tasks in older people with balance impairment (Berg et al 1989).	It can be used in a variety of settings. It can be used as a screening test for risk of falling. A score of less than 45/56 has been shown to be predictive of falls (Berg et al 1992, Gillespie et al 2000). It can be quite tiring for frail older people or those recovering from an acute illness.
Functional reach	This test measures the maximum distance a person can reach forward beyond arms length with a fixed base of support in standing (Duncan et al 1990).	It can be used in many clinical settings; however the older person must be able to stand unaided and the test performance may be affected by fear of falling. It is not appropriate in patients with significant spinal deformities and may be difficult in those with marked dementia. It can also be used as a screening test for risk of falling (Duncan et al 1992).

Lateral reach test	This is a test of ability to reach directly left and right as far as possible from a fixed base of support in standing (Brauer et al 1999).	Lateral reach assesses a distinct component of postural stability. The older person must be able to stand unaided and the test performance may be affected by fear of falling.
One leg stance	This test measures the time in seconds of ability to balance while standing on one leg (Bohannon 2006a).	The test can also be used as a predictor of injurious falls in older people (Vellas et al 1997a). Inability to stand for 5 seconds on one leg is suggested as a marker of risk (Jonsson et al 2004). Impaired one leg stance is also a marker of frailty (Vellas et al 1997b).
Four step square test	This test is a timed performance based test that assesses dynamic standing balance (rapid stepping and obstacle avoidance) in active older community dwelling older people (Dite & Temple 2002)	The physiotherapist should have a clear view of the patient as they step. Have a second person to closely supervise the patient as they perform the test. This test is cognitively challenging as the older person has to understand and incorporate the stepping sequence. A cut-off time of greater than 15 seconds is associated with increased risk of recurrent falls.

Table 7.2 Evaluating therapy interventions – gait

Outcome measure	**Reasoning**	**Testing tips**
Get up and go test	This is a test of sit to stand, walking and turning ability for frail older people (Mathias et al 1986).	This is a staff-rated performance based test rated on a five point scale where 1 = normal and 5 = severely abnormal. A score of 3 or more is at risk of falling.

Timed Up and Go (TUAG)	This is a test of timed sit to stand, walking and turning ability for frail older people (Podsiadlo and Richardson 1991)	The test correlates well with every day function. The chair used should have a seat height of 44-47cms and arm rests as a lower chair may affect the validity of the test (Siggeirsdóttir et al 2002). Try to avoid talking to the person during the test as this may distract them from the task. The test can be used as a screening tool to see if further in-depth assessment of mobility is required. For community dwelling older people a TUAG of 12 seconds is regarded as normal. There is some variation according to age (Bohannon 2006b). TUAG can be used as a falls screening tool but its predictive validity and sensitivity has been variable upon the populations studied, setting and the research methodology (Shumway-Cook et al 2000, Chui et al 2003, Thrane et al 2007, Lindsay et al 2004, Large et al 2006, Kristensen et al, 2007).
6 metre timed walk	Distances limited timed walking tests are useful indicators of functional mobility of older people. Gait speed is important for safe community mobility, e.g.: crossing a road.	A 2 metre distance before and after the course minimises the affects of acceleration and deceleration. Normative data are available (Butler et al 2009)

Table 7.3 Evaluating therapy interventions – combined functional performance

Outcome measure	**Reasoning**	**Testing tips**
Elderly Mobility Scale	This is a standardised scale for assessment of mobility, gait, balance and key position changes in frail older people in an acute hospital or day hospital environment (Smith 1994, Prosser et al 1997).	The test correlates well with function. The test has a ceiling effect for older people who are more able. The functional reach scale differs from the original research paper.
Lindop Parkinson's Assessment Scale	This is a functional assessment scale designed to measure bed and gait mobility in patients with Parkinson's disease (Pearson et al 2009).	The bed mobility section should be performed without shoes on.

Table 7.4 Evaluating therapy interventions – endurance

Outcome measure	**Reasoning**	**Testing tips**

6 minute walk test	This is a useful measure of exercise capacity in older people (Mangan & Judge 1994).	Ideally the test should be conducted in a quiet hallway with cones placed at the beginning and end of 30 metres. The goal is for the individual to walk as far as possible in 6 minutes. The individual is allowed to self-pace and rest as needed as they traverse back and forth along a marked walkway. Encouragement increases the distance walked (Harada et al 1999)

Table 7.5 Evaluating therapy interventions – quality of life

Outcome measure	**Reasoning**	**Testing tips**
SF12/36	These generic scales measure functional health and well-being from the patient's point of view (http://www.sf-36.org/tools/SF36.shtml).	They can be self-administered or completed by interview
EQ-D5	This generic scale measures health related quality of life consisting of five dimensions (mobility, self-care, usual activities, pain and anxiety) plus the individual's rating on a Visual analogue scale of their current health status (Szende A et al 2007)	Self-administered or completed by interview.
PDQ-39	The Parkinson's Disease Questionnaire is designed to address aspects of functioning and well-being for those affected by Parkinson's disease (PDQ-39 – Isis Innovation Ltd, Ewert House, Ewert Place, Summertown, Oxford OX2 7SG UK**T** +44 (0)1865 280830 **F** +44 (0)1865 280831 **E** innovation@isis.ox.ac.uk)	Self-administered.

Table 7.6 Evaluating therapy interventions – fear of falling

Outcome measure	**Reasoning**	**Testing tips**
Falls Efficacy Scale-International (FES-I).	This is a test to measure level of concern of falling during a range of physical and social activities that is suitable for use across a range of cultures and languages (Yardley et al 2005, Kempen et al 2008).	To obtain a total score for the FES-I add the scores on all the items together, to give a total that will range from 16 (no concern about falling) to 64 (severe concern about falling).
Activities Balance Confidence Scale (ABC)	This is a test to measure confidence in doing a range of activities on a scale from 0-100% (Powell et al 1995).	If the older person normally uses a walking aid, ask them to rate themselves as if they were using the aid.

Exercise interventions to prevent falls in

older people at high risk or who have fallen

- The following risk factors for falls can be improved by physiotherapy intervention:
  - Muscle weakness
  - Impaired balance
  - Impaired gait
  - Reduced reaction times.
- Exercise prescription will differ depending upon the individual's history of falls, medical conditions and functional capacity.
- In older people with poor balance, some preparatory strength, co-ordination and flexibility training may be required before unsupported dynamic balance exercise starts.
- Safety is paramount, less challenging balance exercises may need to be prescribed initially, particularly if the older person is exercising at home unsupervised.
- Exercise programmes to prevent falls should include dynamic balance, strength and functional floor activities. They should also aim to include bone loading, power, flexibility, posture, gait training, supported endurance work and tasks to improve visual, vestibular and sensory input (DOH 2009).
- Evidence:
  - Recent reviews and guidance recommend that falls intervention, including exercise, should be considered alongside osteoporosis management to reduce both the number of falls and falls-related injuries (NICE 2004, DOH 2001b, DOH 2007, Skelton and Todd 2004, Sherrington et al 2008).
  - Studies of strength and specific balance training have shown falls reduction in intervention groups when evaluated at the end of one year (Tinetti et al 1994, Campbell et al 1999, Province et al 1995).
  - A randomised controlled trial (RCT) of group based exercise over one year found that the intervention group (community dwelling older people n = 551) had a 22% lower rate of falls than the control group and 31% fewer falls in those who had fallen in the past year (Lord et al 2003).
  - A UK study of community dwelling older people with a history of falls, halved their risk of falls with 9 months of weekly group balance and strength exercise combined with twice weekly home exercises (Skelton et al 1995). In this study the exercise intervention consisted of progressive resistance, gait, balance, functional activity, floor work, endurance and flexibility training. The exercise was individually tailored in type and intensity with most exercise in weight bearing positions, reducing upper limb support.
  - In New Zealand, an RCT of home-based individually tailored exercise (OTAGO) including a warm up, muscle strength and balance exercises plus a walking programme three times per week for one year was found to be effective in reducing falls and injuries in community dwelling older women over 80 years old (Campbell et al 1999). During the study the physiotherapist visited each individual in the intervention group 4 times in the first 2 months followed by regular telephone

contact.

– There have been several studies investigating the effects of Tai Chi on falls. There is some evidence that Tai Chi is effective as a preventative group exercise for older people with impaired balance and strength who have not fallen (Wolf et al 1996). However modified Tai Chi has not been found effective in frail older people (Wolf et al 2003). A review paper by Harmer et al (2008) recommended that longitudinal studies with consistent intervention parameters and clinically meaningful outcomes were required in order to establish the role of Tai Chi in falls prevention.

Long-term physical activity and exercise opportunities

- A major challenge is to ensure a continuum of exercise provision and to make a successful transition from a health care setting (one to one or small group basis) to a community based setting.
- Sherrington et al (2008) showed that the greatest relative effects of exercise on falls rates is seen in programmes that include a combination of a higher total dose of exercise (>50 hours over the trial period) and challenging balance exercises.
- It is important to provide a choice of exercise opportunities to ensure individual need and preference are met, as this is more likely to improve participation and uptake.
- Effectiveness will be determined by how receptive the individual is to the recommendations and by how capable they are when carrying out the exercises independently, safely and effectively (Dinan 2001).
- Evidence suggests that older people will be more receptive and more likely to undertake an exercise programme if the information provided discusses the wider benefits of exercise to well-being and maintenance of independence, rather than just to prevent falls (Skelton & Todd 2004, Yardley et al 2007a, Yardley et al 2007b).

Progressive Resistance training

- Resistance training aims to increase the ability of a muscle or group of muscles to generate force.
- To increase strength, a resistance should be used that allows 6–8 repetitions for each exercise. Aim for a resistance of 65–75% of 1RM. Make sure that the older person has a 1–3 second rest between repetitions and a 90–120 second rest between sets. Aim for 1–3 sets of each exercise using the major muscle groups 2–3 days per week with 48 hours between sessions. The level of effort should be moderate to high.
- On a 10 point scale, where no effort is 0 and maximal effort of a muscle group is 10, moderate intensity is 5–6.
- With frail older people, using body weight is often a sufficient training stimulus initially.

Exercise intensity can be altered by adjusting the performance of the exercise, e.g. reducing the use of the upper limbs when practicing sit to stand or increasing the repetitions.

- Using lighter weights and a higher number of repetitions, particularly if the patient has musculoskeletal disease, will assist the development of endurance and power required for functional activity.
- Gradual progression in weight and repetitions should be made on a regular basis to maintain overload.
- Overuse injuries can occur during resistance training. To reduce the risk, precise teaching instructions and skilled demonstration together with observation of the person and feedback are required.
- Evidence:
  - The greatest strength gains occur in programmes of moderate to high intensity where exercises are performed at 50% or more of the patient's one repetition maximum.
  - Some studies have shown that progressive resistance training programmes improve performance in functional tasks (Jette et al 1999, Fiatarone et al 1990, Vincent K 2002).
  - Other studies have found large strength gains, but no or small improvements in physical performance or function (Jette et al 1996, Judge et al 1994, Skelton et al 1995).
  - A Cochrane review by Liu and Latham (2009) found that resistance training conducted two to three times a week, at moderate to high intensity, with free weights, exercise machines or elastic bands increased strength in older people and had a positive effect on performance of activities such as standing up from a chair more quickly, walking and stair climbing. In addition progressive resistance training improved older peoples' ability to perform more complex functional tasks such as preparing a meal. However the reviewers advised caution when transferring the research into practice as adverse events were not adequately reported in the studies.
  - An RCT of home-based exercise (n = 29) that included progressive resistance training, balance and general physical activity over a 6 month period found that functional performance, dynamic balance, muscle strength and aerobic fitness improved significantly in the intervention group (Nelson et al 2004).
  - An RCT of 3 months low intensity exercise programme versus unsupervised home based flexibility activities in frail older people (n = 84) found significant improvement in the exercise group on frailty markers such as strength, gait speed and balance (Brown et al 2000).
  - Weighted vest exercise has been used safely in older people and has been found to be effective in improving balance, strength and bone mass (Shaw & Snow 1998, Bean et al 2004, Snow et al 2000).
  - Research has also studied frail older people living in care homes although the

sample numbers have been small. Fiatarone et al (1990) found that an 8 week high intensity strength training (n = 10) improved muscle strength and tandem gait speed in nonagenarians in care homes. Ikezoe et al (2005) found that a 12-month low-intensity exercise programme was effective in increasing strength and maintaining balance and mobility in frail older people residing in care homes (n = 28). Sauvage et al (1992) conducted an RCT of a 12 week (3 times per week) programme of PRT and stationary cycling (n = 14) on older men living in a care home. This resulted in significant although limited improvements for clinical mobility scores, strength, muscular endurance and gait velocity.

Endurance training

- Every functional activity has a certain level of cardiovascular fitness required in order to achieve it successfully.
- Older people may be able to carry out activities of daily living (ADL) yet they may have reduced physiological reserve and be close to their maximum aerobic capacity.
- When faced with a more challenging task, they may be unable to meet these extra energy needs and their level of fitness then becomes apparent.
- The relative intensity of moderate physical activity (still able to maintain a conversation, but breathing slightly harder than normal) will depend on the age and fitness of the older person. It is helpful to educate the older person to listen to their body using the Borg scale of perceived exertion (Borg 1998).
- For some people this may require sustained activity, e.g. cycling on a stationary bike; for others with lower levels of fitness, it may mean walking at quite a slow pace.
- For frail older people a 10 minute walk may be beyond their functional capacity and they will have to begin with shorter bursts of activity.
- Evidence:
  - Research has shown that older people can benefit from endurance training. Buchner et al (1992) in a review of 22 studies found that 3–12 months of aerobic exercise improved aerobic capacity by between 5 and 20%.
  - An RCT of a 4 month programme of aerobic training, yoga and flexibility and a waiting list group (n = 101 older men and women (mean age 67)) found that aerobic training produced an overall 11.6% improvement in peak VO_2 and a 13% increase in anaerobic threshold (Blumenthal et al 1989).

Functional strength training

- Reduced muscle power is one of the underlying mechanisms of reduced functional ability.
- Studies focusing on increasing muscle power have not always translated into improvements in functional tasks in older people.

- It has been suggested that this may be due to insufficient specificity between the mode of training and the desired mobility task.
- Evidence:
  - Skelton et al (1996) carried out an RCT that involved patients in an 8 week moderate intensity exercise programme (n = 19) involving community dwelling older women. The study found that there was training associated improvements of 9–55% in quadriceps and handgrip strength, flexibility, balance and selected tests of functional ability. Exercise comprised one supervised session (progressive resistance training and functional strength training) and two unsupervised home sessions of resistance exercise per week.
  - An RCT of a 12 week (3 times weekly) functional task exercise programme in community dwelling older women (n = 98) was more effective than resistance exercises at improving functional task performance at 3 and 6 months (de Vreede et al 2005).
  - An RCT of 12 week task-specific resistance training in community dwelling older people (n = 161) showed a significant training effect for bed and chair rise tasks (Alexander et al 2001).
  - McMurdo and Johnstone (1995) conducted a RCT of a daily 6 month home exercise programme (health education or mobility training or PRT) on community dwelling older people with limited mobility and dependence in at least one ADL. The results showed a trend towards improvement in both exercise groups in the sit to stand test and timed up and go tests.
  - Gill et al (2002) conducted an RCT of a 6 month home based intervention programme that included daily balance, muscle strength, transfer training and gait re-education (n = 188) of frail community dwelling older people designed to prevent functional decline. Participants in the intervention group had less self-reported disability at 7 and 12 months and the most benefit was observed among those with moderate frailty. This was not the case with participants with severe frailty.
  - A further trial by Gill et al (2004) considering a home-based programme, focused on improving underlying impairments in physical ability in frail community dwelling older people. Subjects in the intervention group had reductions in Instrumental ADL disability and gains in mobility and physical performance at 7 and 12 months.
  - The research suggests that a combination of strength training and functional strength training results in functional gains in frail older people. The association between strength and function may be curvilinear: a critical amount of strength is required for 'normal' performance of specific activities. Above this threshold level of strength, further increase will not enhance the performance of the task. But below this threshold, there should be a stronger relation between strength and change in performance (Buchner et al 1996).

Balance re-education

- Balance exercises must be task and context specific.
- Actions may need to be modified initially so that the postural adjustments required are relatively small, e.g. sitting unsupported, reaching out with one hand at a time to touch the physiotherapist's hand.
- Actions can be made more demanding by:
  - Changing the shape and base of support
  - Increasing the movement amplitude by increasing the distance of the object to be reached
  - Increasing speed
  - Increasing weight of the object
  - Using both hands
  - Requiring a quick response, e.g. catching a ball
  - Introducing simultaneous performance of two tasks.
- When a person is practicing a specific balance activity, feedback from the physiotherapist must be immediate and specific.
- The older person has to learn to assess and correct his own performance.
- The activity has to be challenging enough to test their balance and postural stability; however care must be taken to ensure the safety of the older person practicing the task.
- Evidence:
  - A Cochrane review by Howe et al (2007) found that exercise has statistically significant positive effects on balance as opposed to usual activity for older people. Interventions that appeared to have the greatest impact were walking; balance; co-ordination and functional exercises; muscle strengthening; and multiple exercise types. Improvements were seen in the ability to stand on one leg, reach forward without overbalancing and walking. However the majority of the studies only had short follow up times.
  - Wolf et al (2001) investigated the effect of a 12 sessions of individualised exercise programme on balance dysfunction in older people in a randomised multi-centre trial (n = 94). Subjects in the exercise group had significantly improved functional balance at the four week follow up but the effect had worn off by one year.
  - An RCT of a 6 week balance training programme consisting of repetitive tasks of increasing difficulty specific to the functional problem in community dwelling older people with balance impairment (n = 199) was effective in improving balance and gait speed at 6, 12 and 24 weeks after intervention. The control group received physiotherapy for mobility problems and also improved.

Walking aid provision

- Walking aids are commonly prescribed to increase an older person's walking ability and

decrease the risk of falls.

- The main indications for a walking aid are:
  - Excessive pain on weight bearing (Deathe et al 1993)
  - Decreased leg muscle strength and control (Tyson and Ashburn 1994)
  - Instability (Deathe et al 1993)
  - Shortness of breath
  - People with chronic airflow limitation and other respiratory or cardiac conditions may find a wheeled walking aid helpful. Some studies have found that using a walking aid can increase walking distance (Chrisafulli et al 2007, Roomi et al 1998).
  - Poor vision
  - Poor distal lower limb proprioception (Deathe et al 1993)
- These impairments may be associated with acute events such as major illness or surgery, or with chronic conditions leading to a more gradual decline in physical ability.
- A walking aid should be prescribed only after thorough assessment of the person's physical problems and clinical reasoning about the causes. Provision of a walking aid should not be seen as the sole solution to the impairments identified during the assessment process. Strategies to address the specific impairments should be implemented as part of the treatment plan.
- When a walking aid is used, the individual is essentially using their upper limbs to support the lower limbs in the maintenance of an upright posture. If a patient becomes reliant on a walking aid, they may become more unsafe during sit to stand or when reaching out of their base of support during everyday tasks (Simpson et al 2002). Older people who use a walking frame should practise standing unsupported with a sturdy support in front of them, several times a day.
- The older person's abilities and skills to use the walking aid along with the environment including steps, position of furniture, and type of floor coverings must be taken into account when prescribing a walking aid. Early assessment of the environment and the suitability of a walking aid should be made by a physiotherapist and an occupational therapist if a new walking aid is being considered. Referral to community therapy services should be made if the physiotherapist feels that further review is necessary after discharge from acute care.
- Common scenarios and walking aids.
  - A inpatient who is anxious when mobilising across the bay in an acute hospital environment may request a wheeled Zimmer frame so that they can mobilise independently and confidently. On a home visit, they disregard the frame and walk safely around their property using the furniture.
  - A person with dementia may be able to use a walking aid appropriately when prompted or supervised. The nurses report that they have observed the person carrying the walking aid while walking. The physiotherapist needs to consider the potential for the long-term use of a walking aid.
- Ensure that the older person and/or carer are taught how to maintain the walking aid. It is not uncommon to see worn ferrules or loose fixings.

- Some older people may be reluctant to use a walking aid as the use of an aid may be perceived as a sign of frailty or aging. The physiotherapist needs to be mindful of these issues when suggesting a walking aid. Always discuss the reasons behind the recommendation of a walking aid to the person.

Gait re-education

- Parallel bars can be a useful piece of equipment to use to initiate walking, especially if the individual is fearful of falling or weak from an acute illness, prior to walking on the ward or an open area.
- Once standing, encourage the person to move the upper limbs in turn forwards and backwards on the bars.
- Weight transfer:
  - Practise weight transference from one leg and arm to the other.
  - Facilitation at the pelvis and use of a mirror can be helpful in encouraging adequate transference of weight prior to stepping practice.
- Stepping practice:
  - Standing: stepping over an external visual cue, e.g. lines on the floor, foot printed shaped mats.
  - Stride standing: the person transfers their body weight from the back leg to the leading leg, stepping through with the back leg.
  - A visual target on the floor can be used to encourage a normal step length.
- Gait re-education
  - Ask the person to walk inside the parallel bars, using the bars for support initially.
  - Again a mirror can be helpful in providing feedback.
  - Give immediate and specific feedback to the person.
  - The physiotherapist can increase the difficulty by asking the person to walk holding onto one bar.
- Gait re-education in a ward/rehabilitation area:

– Always set a target distance and place a seat clearly in view.
– Encourage the older person to set their own target distance.
– This target should be frequently revised.
– Allow frequent rests if the person is fearful or weak.
– As they improves, increase the distance and reduce the number and length of the rest periods.
– Place chairs at strategic places.
– Turning must be taught early.
– For an individual to be able to function in a complex environment, practice should include walking around obstacles, carrying an object and dual tasking.

Teaching a patient how to get off the floor and coping strategies

- If an older person has a history of falls, exercise should retrain or maintain the ability to get up from the floor to avoid a 'long lie'.
- A long lie (more than 1 hour on the floor) and the resultant complications can be more severe than the initial fall itself.
  - Wild et al 1981 found that 50% of those who lie on the floor for an hour or longer die within 6 months, even if there is no direct injury from the fall.
  - Vellas et al (1987) found that more than 20% of patients admitted to hospital because of a fall had been on the ground for an hour or more.
  - Tinetti et al (1993) found that 148/313 (47%) of non-injured fallers were unable to get up following a fall.
  - McCabe (1985) found that 75% of housebound older people were unable to get up from the floor.
  - Some of the difficulty in getting up from the floor may be due to shock or injury, or anxiety of further injury to the body, but for many lack of physical fitness is an important cause (Skelton et al 1999).
- Therefore the physiotherapist must teach coping strategies that the older person can use if they do fall again and teach them an appropriate method to get off the floor if possible.
- There is minimal research in this area. A small randomised controlled trial (n = 48) suggested backward chaining was the most successful method for teaching patients to get on and off the floor (Reece and Simpson 1996).
- Backward chaining is a method for teaching a patient to perform a functional task by breaking the task down into smaller stages. The chain of subtasks is taught sequentially beginning with the last step in the sequence. As this step is mastered, the preceding step is taught and the step preceding that until the whole chain has been learnt. If the patient experiences difficulty in mastering a subtask, then it is broken down into even smaller steps.
- Reasons for teaching a person to get onto and off the floor may include:
  - Patient may be at risk of falls
  - Allowing a person to carry out floor work on mats by providing a safe and simple method of getting up and down
  - Increasing confidence and functional independence
  - Provide the person with coping strategies once on the floor.
- Hazards and risks
  - Individuals with orthostatic hypotension
  - Patient groups with reduced joint range in hips, knees and ankles and/or reduced upper limb/body strength e.g. hip replacement, osteoarthritis, rheumatoid arthritis, severe osteoporosis, moderate to severe stroke
  - Cognitive/perceptual/behavioural/communication impairment

- Patients who are fearful of getting onto the floor
    - Patients unable to lie supine; postural impairments, orthopnea, hiatus hernia and pain
    - Moderate to severe tonal changes
    - Unprotected hemiplegic shoulder with : marked reduction in muscle tone, glenohumeral/radiocarpal joint subluxation, poor voluntary control/functional movement in the upper limb, inattention or neglect
    - Patients with painful soft tissue or joints
    - General frailty
    - Severe dyspnoea at rest or with minimal exertion
    - Recent hip surgery within past 4 months.
- Preparing the environment
    - Ensure sufficient space
    - Mat on floor
    - Ensure hoist and sling is available and functioning, e.g. battery is charged
    - Patient to be wearing appropriate clothing
    - Adjacent furniture is stable ie: plinth, chair, bed
    - Have pillows, wedges, blocks, stools available that can be incorporated into the training.
- Methods and positions for patients to practise:
    - Stride standing to half-kneeling

      Patient holds onto a chair or plinth (static furniture) with both hands and lowers back knee onto a mat or wedge cushion, then rises back to stride standing. This movement can be graded using varying heights of cushions and is complete when the patient is fully weight bearing. The physiotherapist supports the patient's pelvis from the side and slightly posterior and follows the movement of the patient.
    - Standing to High-kneeling (Figure 7.1):

      Patient holds onto a chair or plinth (static furniture) with both hands and lowers back knee onto a mat or wedge cushion, then front knee onto the floor (high kneeling) then back to half kneeling and back to standing.

      The physiotherapist supports the pelvis from the side and slightly posterior and follows movement of the patient.
    - 4 point kneeling (Figure 7.2):

      As for previous two methods, patient puts one hand down onto the floor followed by the other hand (4 point kneeling) then lifting one arm at a time rising up as per high kneeling.

      Physiotherapist supports from mid chest point whilst kneeling next to patient to help assist patient lowering and raising thorax to place and remove hands on the floor.
    - Side sitting (Figure 7.3):

      Patient gets into position of 4-point kneeling, maintaining extended arms, the

patient side flexes and lowers pelvis to rest greater trochanter on one side onto a mat or wedge/cushion. The return moves the patient into 4-point and then into standing via high kneeling.

The physiotherapist kneels by the side of the patient and guides the patient's pelvis towards them and onto the mat or wedge/cushion.

- Side lying:

  As for side sitting the patient lowers themselves down onto weight bearing side onto a mat using one or two arms. The return raises them back into side sitting, then 4 point kneeling and high kneeling and back into standing.

  The physiotherapist moves in front of the patient (still kneeling), supporting with one hand on the pelvis, and the other hand under the rib cage. The physiotherapist assists with lowering the trunk onto the mat.

- Supine lying

  As for side lying then the patient rolls from side lying to supine, then back into side lying and follows the steps back through to standing.

  The physiotherapist (still kneeling) supports from the pelvis and shoulder girdle to assist with the movement

- Safety note: If the patient is unable to raise themselves from the floor a hoist will be required to achieve this.
- The physiotherapist must take care of their own joints when facilitating the movement of a patient onto and off the floor.
- The importance of back and general posture must be a priority.
- Modifications:
  - Starting positions may include sitting on the edge of a chair, side sitting on a plinth or bed or using additional supporting surfaces in front.
  - Older people who lack joint flexibility, have severe shortness of breath or are too frail to be taught, should discuss how they would summon help in the event of another fall and in case help is slow to come, how they would prevent the complications of a long lie.
- Patients should also be taught how to move about the floor, to reach for a telephone (placed at a low level) or alarm cord, to reach a blanket or something else to keep warm (kept in a bottom drawer or other place accessible near the floor).
- Simpson and Mandelstam (1995) found that some older people do not face up to the risks of falling, often having unrealistic expectations of their own abilities to get up or summon help. The physiotherapist should ask the patient to demonstrate their coping strategy.
- Don't assume that the patient who has an alarm system actually knows when and how to use it or when they should wear the alarm. When older people are in acute care, the physiotherapist should initiate these discussions in collaboration with the MDT and if necessary ensure that they are reinforced when they return to the community.

Figure 7.1 High kneeling.

Figure 7.2 Four point kneeling.

Figure 7.3 Side sitting.

Functional transfer training

- Physiotherapy should provide opportunity to practise every day tasks such as techniques for efficient and safe transfers in and out of chairs, beds and cars.
- Standing up from a seated position is a critical preliminary to walking and therefore to independence.
- Once the person has moved forward to the front of the chair, ensure that they place the feet back, so that initial ankle dorsiflexion is approximately 75°. The hands should be placed on the chair arms. Discourage the person from pulling up on a walking aid. It may be helpful to place the walking aid a little further away. Encourage them to lean forwards 'nose over your knees' and 'push up to standing'. A rocking forward motion can give momentum to the movement.
- A common observation is the person's feet sliding forward. This can happen if the feet aren't back far enough, if they are not forward enough in the chair or they do not lean far enough forwards. Avoid blocking the person's feet with your own (risk of injury to feet).
- Encourage forward momentum before extension of the trunk (place a non-slip square of material under the feet, if the feet slip). Check the length of the soleus/gastrocnemius muscles, which can become shortened with disuse and physical inactivity. Strengthen the lower limb extensors and the anterior tibialis muscles.
- Clarify the specific heights and any equipment used in the home environment with occupational therapy colleagues and/or carer (task specificity).
- Don't forget to practise stand to sit. Some patients will start to turn around while some distance away from the chair resulting in an unsafe transfer, especially if they are tired after mobilising. The physiotherapist should teach them to walk up to the chair and only start turning when they are close enough.
- Some frail older people may have assistance to get into bed by carers/family members. However, bed transfers should still be taught especially if the person needs to go to the toilet during the night.

Techniques for promoting movement in older patients with cognitive impairment

- Consider the environment. Close curtains around the bed side to minimise distractions and to maintain the person's dignity.
- Is there an alternative environment if the person is distractible?
- Joint sessions with family/carers can be helpful to increase participation.
- General points to consider:
  - Seating
  - Footwear and clothes
  - Hearing aids and dentures

  - Spectacles.
- Suggested strategies: Moving from sitting to standing.
  - Put a chair (or walking aid) in the space in front of the person
  - Ask them to stand up either firmly and politely, or lightly and casually to suggest the ease of the task
  - Use a gesture to indicate the need to stand up
  - Use a stationary touch cue or sweep your hand up the person's back
  - Place their hands on the chair arms as a cue to the movement
  - Use a goal based cue: 'Get your nose over your toes'
  - Sit beside the person and lean forwards in an exaggerated way to show them what they have to do
  - Provide a firm pillar of support for the person to push against: for example, providing the individual with bed blocks as a substitute chair arm
  - Use the palm to palm thumb hold (or a suitable alternative) to stop the person from gripping the arms if getting out of a chair
  - Keep your hand soft and relaxed
- Remember that if two people go to assist, this may convey to the person that you expect the movement to be difficult- so start with just one assistant
- Throughout the process ensure there is adequate: time, repetition and reassurance
- Never pull a person out of their chair
- Approaching a chair: aim to reduce anxiety and anticipate and manage misjudgements.
- Suggested strategies:
- Assist at the person's side so that you are both facing and moving in the same direction. Encourage the person to approach the chair across its front using a curved pathway, especially if they use a walking aid
- Encourage the person to get their feet beyond the mid-line point on the ground, between the front legs of the chair, with the walking aid positioned even further ahead, before starting to sit down
- Make sure the person to keeps the chair in sight and sits down sideways on it
- Give little taps to the person's hips to turn them towards the chair (a directional cue)
- Use your own thigh or knee to guide the person's hips safely into the chair.
- Always avoid blocking the person's view of the chair.
- If someone is recovering from a recently repaired hip fracture, they must not sit down sideways-instead the chair needs to be directly behind them. Because this means that they cannot see the seat, they may need more reassurance than usual before they sit down.

Walking

- General points to consider:
  - Footwear

– Clothes/incontinence pads
– Drainage bags, catheters.

• Suggested strategies:
    – Assist at the person's side, so that you are both facing and moving in the same direction.
    – Aim to cover a short distance to a seat that the person can see
    – Give the walk a purpose for example to eat a (meal, watch TV, see a visitor, go to the toilet, or do some exercise)
    – Give effective physical support or use a walking aid. Use the back of a row of chairs for support and practice
    – Add to the sound of the person's footsteps with your own (providing a sound cue)
    – If the person tends to grab the furniture, walls, you or other people, give them something to hold in their free hand
    – Give them the opportunity to walk for longer distances so they have time to get into the rhythm of walking
    – Reassure the person about the surroundings (hard to soft floor coverings, dark to light etc)
    – Encourage longer strides by using a 'goose-step' (providing a visual cue)
    – If the person's feet shuffle, encourage marching and/or sing a maching tune
    – If the person's feet 'stutter', stop and restart by 'stepping'
    – If the person threatens to sit down on an imaginary chair, tell them firmly 'Stay standing – stand up' rather than 'Don't sit down'
    – When guiding a falling person on to the floor, follow the technique of sliding a falling person down your body
    – Learn the technique of sliding a falling patient down your body onto the floor
    – Make walking an enjoyable experience by conversing with them and paying them plenty of attention
    – Be aware that the person's abilities may change from hour to hour or during the day.

• Never tow a person

Steps and stairs

• General points:
    – Good lighting is needed
    – Encourage the person to place their whole foot on each tread
    – Make sure that an unsteady or breathless person places one foot onto the tread, then the other (two feet on the same tread) in order to slow the movement down and allow for better control.

• Suggested strategies:
    – Step down the step just ahead of the person to show the change in level (visual cue)
    – Step down the flight of steps or stairs slightly in front of the person, to partially block the space ahead (gap-filling)

  – Or encourage the person to use both hands on one rail and come down sideways
  – Paint the edge of concrete steps with a wide stripe in a contrasting colour.
- Even if a person does not need to be able to go up and down stairs, they often need to be able to manage steps.

Transfers

Chair

- The 'receiving' chair should be positioned close to and at about 90° to the chair that the person is sitting on.
- Suggested strategies
  – Place an extra (third) chair in the space in front of the person (as a gap-filling strategy)
  – Demonstrate the side to side rocking motion if the person needs to move to the front of the chair (providing a visual cue)
  – Tell the person to 'Sit here please' and slap the seat of the chair (providing a sound cue)
  – During the transfer, lightly tap the person's hips in the direction of the receiving chair (providing a touch cue)
  – If you are assisting the person on your own, stand in the space between the backs of the two chairs to help the person's hips across more easily
  – If there are two of you assisting, one of you can help at the person's side while the other stands in the space between the backs of the chairs.
- The most common patterns for transferring are to reach across and transfer, or to stand up and then transfer. Alternative methods of transferring include using a slide board, and then sliding the person across it, or using a weight-bearing hoist if necessary

Bed

Moving from lying to sitting on the edge

- This involves major changes of position, so that the person needs reassurance and time to adjust to each change.
- Suggested strategies:
  – 'Get up please' with a rising gesture (providing a visual cue)
  – 'Sit on the edge please' (providing a goal based request)
  – Make sure the person is lying with their knees bent up, Then encourage them to roll onto their side by asking them to look at you, and to reach for the edge of the bed or your hand
  – Prevent the person from seeing the drop to the floor by using a gap filling strategy. At the level of their head, you can either use your own body to block the view or

place a; pillow lengthways along the edge of the bed or position a chair with its back against the side of the bed.

Sitting on the edge of the bed to lying down

- This is a major change in position.
- Suggested strategies:
  - Use the command 'Lie down please' and slap the pillows (providing sound cues)
  - To encourage the person to lie down along the length of the bed say 'Here's the pillow' and help the person to feel it, (providing a touch cue)
  - Ask the person first to lift their legs onto the bed and then to lie down.

Moving across the bed

- Suggested strategies:
  - 'Move across here, please' with a sliding gesture (providing a directional cue)
  - Offer guidance with touch cues
  - Use a slide-sheet to help the person move their hips across.

Moving along the edge of the bed

- Suggested strategies
  - 'Move along please' accompanied with a gesture (providing a directional cue)
  - Sit beside the person and encourage them to use a bed block as a substitute chair arm: this enables them to raise their hips higher and move sideways more easily
  - Sit beside the person and move up very close against them. Move even closer moving into their personal space, and ask them to 'Move up/along/across please'
  - Alternatively sit away from the person and pat the bed to encourage them to move towards you, saying 'Come and sit beside me'.
- Note: If the person seems to be afraid or unwilling to move, place a chair in the space in front of them, with its back towards them (as used during standing or transferring).
- Older people with both a mobility problem and dementia can be perceived as a poor rehabilitation prospect. However clinical reports suggest that functional improvements can be made, despite cognitive impairment, if the practice of independence skills is encouraged and specific stimulation is directed at improving mobility skills (Oddy 1987).
- Although the evidence is limited, the research that does exist suggests that older people with dementia can respond to rehabilitation. Pomeroy (1993) conducted an RCT of 24 subjects resident in a long-term care facility, who had severe dementia (age 65–91). It was found that there was a significant improvement in mobility skills following a period of physiotherapy input (90 minutes per week for 6 weeks).
- Huusko et al (2000) performed a subanalysis of an RCT to evaluate the effect of intensive geriatric rehabilitation on patients with dementia following hip fracture. Three months after surgery, in the intervention group 91% of the patients with mild dementia and 63%

of those with moderate dementia were living independently. In the control group, the corresponding figures were 67% and 17%. There were no significant differences in patients with normal mini-mental state or severely demented patients. They concluded that hip fracture patients with mild to moderate dementia can often return to the community if they are provided with active rehabilitation programme to facilitate this.

Falls interventions for older people with dementia

- An RCT by Shaw et al (2003) investigated the effectiveness of multifactorial intervention after a fall in 274 older people with cognitive impairment and dementia attending the A&E department. There were no significant differences between the intervention and control groups in the proportion of people who fell during 1 year follow up. The authors concluded that multifactorial intervention was less effective in this patient group compared to cognitively intact older people.
- However, as older people with cognitive impairment and dementia are at high risk of falls, it is important that prevention of falls remains a research priority in this patient group.
- Shaw 2007 provides a rationale for a different approach to falls prevention in older people with dementia (MMSE < 20). She suggests that this population have a higher prevalence and severity of risk factors including gait/balance impairment, psychotropic medications plus behavioural risk factors such as wandering.
- Further work is required to determine optimal delivery of interventions and to identify the most important modifiable risk factors.

Fear of falling: techniques for promoting movement

- An older person with fear of falling may be so anxious about moving that they push themselves backwards when trying to stand up from a chair or walk cautiously with short, tentative steps.
- Rank the person's goals in order of difficulty/level of anxiety for the person.
- Practise each step of hierarchy:
  - With the physiotherapist assisting (or provide sturdy support and reduce gradually, e.g. parallel bars, plinth in front of the person)
  - With the therapist giving verbal prompting
  - With therapist near the person
  - With therapist standing at a distance
  - With therapist out of sight.

- Use praise, support, encouragement and distraction if necessary. Make sure that you 'over consolidate' a stage before moving onto the next stage.
- Never ask a person to practise a task alone or with a carer/relative if they haven't achieved that stage alone or with carer in the presence of the therapist.
- Increase the level of difficulty in very small stages determined by the level of anxiety associated with each stage. Start from where the person is 'at', then increase either a) the distance to walk or b) increase the repetitions or c) increase the complexity of the task. The older person should always succeed.
- Suggested hierarchy for walking across a room despite fear of falling.
  - Stand unaided
  - Walk on the spot or move in standing, near to something to hold onto
  - Walk short distance from chair to chair unaided
  - Gradually move the chair further away (person in control)
  - Walk across a small room
  - Walk across a larger room
  - Walk across the room with others walking about too.
- Given that fear of falling can exist in the absence of a history or risk of falls, it is an important clinical problem.
- A systematic review (Rixt Zijlstra et al 2007) found limited but fairly consistent findings of effectiveness in trials of home-based exercises, fall-related multi-factorial programmes and community-based tai chi group sessions.
- Tennstedt et al (1998) conducted a single blind controlled trial to investigate the effectiveness of a community based group programme to reduce fear of falling and associated activity restrictions in activity levels among older people (n = 434) (eight sessions over 4 weeks cognitive behavioural intervention). Intervention subjects reported increased levels of activity and greater mobility control immediately after the intervention ($p < 0.05$). A decrease in effects was noted by the 6 month follow up, suggesting that ongoing sessions may be required to maintain improvement.
- An RCT of multi-factorial intervention to reduce the risk of falls in community dwelling older people resulted in significant reductions in fear of falling for intervention subjects compared to the controls (Tinetti et al 1994).
- RCTs considering the effectiveness of Tai Chi; Zhang et al 2006 Wolf et al (1996) and Sattin et al (2005) also found significant reductions in fear of falling.
- In two other trials for falls reduction interventions, one yielded no change in fear of falling Reinsch et al (1992), whereas the other showed an increase in fear of falling among the intervention subjects (Hornbrook et al 1994).

Not achieving goals

- Is the problem identified accurately?
- Is the goal achievable?

- Examine influencing factors:
  - Change in social or family circumstances
  - Change in physical or mental condition, be on the alert for early signs and symptoms of acute illness, depression, confusion and discuss your concerns with the MDT
  - A sudden change in functional ability may be due to a new acute illness
  - Has the person been participating?
- Review the case, reassess the person's goals and discuss these with the person, your line manager, peers and the multidisciplinary team. You may need to change your intervention.
- If the person has reached their full potential, the physiotherapist should change the goal to a maintenance goal and teach the individual and/or carers a maintenance programme.

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Chapter 7

E-materials

Author profiles

Louise Briggs MSc BSc(Hons) MCSP

Louise has worked in older peoples' services since 1993 and has particular interest in service development in falls, fragility fractures and dementia. She currently works at St Georges Healthcare NHS Trust as AHP Therapy Consultant and is an Honorary Lecturer at St Georges University.

Louise is also a project officer of AGILE and provides specialist advice to various national committees.

Case Study 7.1

Background

- Mr L is an 86-year-old man who lives with his wife in a house (3 steps with two rails into the property).
- His wife (82 years old) is the sole carer and assists with personal care, medication and all domestic activities of daily living.
- Mr L goes to a day centre twice a week.
- The bedroom and bathroom are upstairs (stair lift) and he usually gets up at night to pass urine.
- He is mobile with a wheeled frame indoors but sometimes forgets to use it and he has an attendant-propelled wheelchair for outdoor mobility.

History of present condition

- Mr L was admitted to hospital with pyrexia, urinary frequency and incontinence.
- His wife reports that he had been become increasingly confused and had 2 falls in the last week, each time, their neighbour had to help him up from the floor.
- His past medical history includes vascular dementia, osteoarthritis knees, COPD and stroke with residual left-sided weakness.
- His medications include simvastatin, paracetamol, clopidogrel, Ventolin and salbutamol inhalers.

Assessment on admission

- Mr L is diagnosed with a UTI and acute confusion.
- The medical management plan is IV fluids and IV antibiotics.
- The MTS is 5/10.
- The estimated date of discharge is 5 days.

Physiotherapy assessment

- The physiotherapist assessed Mr L the next day.
- He was found to be disorientated to time and place, but was able to follow one-step instructions. On admission Mr L's AMTS was 3/10.
- He could move his upper limbs through range. There was moderate rigidity on passive movement especially at the elbow and wrist of the left upper limb.
- He was able to move his lower limbs on command, but had residual weakness of the left lower limb especially the hip flexors and quadriceps (grade 4/5 Oxford scale) with reduced range of movement at the left ankle (plantargrade just achieved).
- The physiotherapist noted reduced muscle bulk of the quadriceps bilaterally and degenerative changes in both knees.
- The physiotherapist and a physiotherapy assistant assessed Mr L's ability to complete bed transfers.
- He was able to transfer from lying to sitting with moderate assistance of 2.
- He appeared to be fearful of moving and required reassurance when rolling.
- He was able to sit unsupported on the edge of the bed.
- On the first attempt to stand using a wheeled frame, Mr L pushed himself backwards and tried to pull up holding on to the frame.
- To make the transfer to the chair safer, the physiotherapist used a rota-stand with the assistance of 2.
- The physiotherapist gave a handover report to the nurse in the bay and documented Mr L's current functional ability.
- The physiotherapist identified that Mr L was unable to transfer independently (lying to

sitting and sit to standing) due to fear of falling and when moving from one position to another. In addition he had generalised weakness precipitated by the acute illness.

- He was at risk of falls due to cognitive impairment with possible delirium, residual left-sided weakness and reduced muscle power in addition to gait and balance impairment.
- The physiotherapist also noted that Mr L had been unable to get up from the floor following his falls.
- When the physiotherapist discussed what Mr L would like to achieve, he stated that he would like to go home. The physiotherapist involved Mr L's wife in goal setting.
- The physiotherapist helped Mr L to break this goal down into smaller short-term goals. The short-term goal was to be able to transfer consistently with assistance of one in 2 days and to mobilise with a rollator frame 6 metres with assistance of one in 4 days.
- The Elderly Mobility Scale was chosen as an outcome measure (initial score 0/20).
- The physiotherapist referred Mr L to the occupational therapist.

Treatment

- The treatment plan included a combination of daily specific functional transfer practice with the occupational therapist on lying to sitting, sitting to lying and transfers from the bed, chair and toilet.
- The physiotherapist also prescribed balance exercises in standing with bilateral upper limb support and progression to less support.
- Gait re-education was commenced in parallel bars and progressed to mobilising with a wheeled frame with a chair placed in strategic places.
- The physiotherapist arranged treatment sessions with his wife present so that she could see how her husband was progressing.
- The physiotherapist increased the practice sessions by delegating to the physiotherapy assistant and health care assistant in the bay.
- This ensured that mobility practice could take place throughout the day.
- Over the next 3 days, Mr L is more orientated (MTS 7/10) and is able to transfer with supervision and mobilise 5 metres with a wheeled frame and supervision.
- The Elderly Mobility Scale improved to 8/20.
- Stepping practice onto the first step of a set of stairs with bilateral hand rails was added to the treatment plan.
- The nurses reported that Mr L managed to use a urinal bottle independently at night-time.

Outcomes

- The multidisciplinary team met with Mr L and his wife to discuss his progress and to plan for his discharge.
- Mrs L wanted to continue being the sole carer for her husband, but was concerned that

Mr L may fall again.

- The options for further assessment and management of falls risk were discussed with Mr L and his wife.
- The multidisciplinary team referred Mr L to the Intermediate Care team for further rehabilitation at home plus a falls clinic appointment.
- The social worker provided information about voluntary agencies that can provide sitting services.

Case Study 7.2

Background

- Mrs Clarke is 85 years old.
- She lived alone in a first-floor flat, her husband died 10 years ago.
- Mrs Clarke was able to walk around her flat, sometimes holding on to furniture to steady herself.
- She had not been out of the flat on her own since a fall 6 months previously, but was able to go to the supermarket with her daughter occasionally, getting around the supermarket by using a trolley for support.
- Her daughter visited her every day to prepare her evening meal.
- Mrs Clarke drank a small glass of sherry most evenings before her meal.

History of present complaint (HPC)

- Mrs Clarke had four falls in the past 6 months.
- The falls tended to happen indoors, when she was turning or reaching up.
- She did not feel dizzy and has never had a blackout, but sometimes felt lightheaded on standing up.
- She fractured her wrist when she fell in the kitchen 6 months ago.
- So far, she has been able to get up after falling.

Past medical history (PMH)

Her PMH includes hypertension, osteoarthritis in her knees and glaucoma.

Drug history (DH)

Aspirin, bendrofluazide, ramipril, co-codamol, temazepam, eye drops for glaucoma.

Management

She was referred to the multidisciplinary falls clinic by her GP, which she attended with her daughter.

Mrs Clarke felt that her balance and walking had deteriorated over the past 6 months and she wanted to be more confident walking outside.

Physiotherapy assessment

- Although Mrs Clarke was able to transfer independently and safely she was unable to transfer without using her arms.
- She was unable to stand on one leg.
- Gait assessment showed increased time during double stance, variability in stepping, reduced heel strike and unsteadiness on turning.
- Mrs Clarke was unable to walk and talk at the same time.

Multidisciplinary team (MDT) assessment

The MDT identified a number of falls risk factors:

- Reduced muscle strength of the hip abductors and extensors.
- Quadriceps muscle lag.
- Gait and balance impairment.
- Visual impairment.
- Night time sedation.
- Postural hypotension.
- Alcohol intake.

Physiotherapy treatment

- Physiotherapy intervention included twice-weekly progressive muscle strengthening with Thera-Band and weights, balance re-education, floor work and gait re-education in the 'Stay Steady' group.
- The group had weekly health promotion talks including bone health and importance of physical activity.
- The physiotherapist provided a home exercise programme concentrating on strength and balance exercises with visual and written instructions to be completed twice a week.
- The physiotherapist organised a graduated walking programme for outdoor mobility conducted by a technical instructor.
- Discussions were held with Mrs Clarke to ascertain what she would do if she fell again.
- Information was provided about care-alarms.
- The physiotherapist chose FES1 (38/64) together with Berg Balance scale (40/56), Turn

180 (8 steps to the left and 7 steps to the right) as outcome measures.
- The physiotherapist explained to Mrs Clarke that continuing to exercise regularly would help her to stay active and healthy.
- Mrs Clarke was encouraged to attend a local exercise group run in the community hall specifically for older people.
- During Mrs Clarke's last treatment session a health promotion talk was conducted by one of the older people who attend the local exercise group.
- Mrs Clarke agreed to be referred to the community exercise programme.

Outcomes

- After the 12-week programme, Mrs Clarke's gait and balance outcome measures were found to have improved (Berg Balance Scale 50/56 and TURN 180 6 steps in both directions).
- There was no change in the FES1 but Mrs Clarke reported that she had been walking to the local newsagent for a paper in the morning over the past 2 weeks.

Case Study 7.3

Background

- Mr Jones, 80 years old.
- He lived alone in a flat with a flight of stairs to access the property (no rails).
- Mr Jones mobilised with a stick indoors and used a shopping trolley outdoors.
- He liked to have a bath, but had found this becoming more difficult.
- He was able to manage the shopping and had a friend to assist with his laundry.
- He was known to the community cardiac failure nurses, but had no formal social service input.

History of the present complaint (HPC)

- Mr Jones was admitted to hospital with cardiac failure.
- This was his third admission to hospital with an exacerbation of cardiac failure.
- He reported that on the morning of his admission his legs felt as if they were giving way and he nearly fell.

Past medical history (PMH)

CCF, bilateral hernia repair and cataracts.

Drug history (DH)

Lisinopril, furosemide, metoprolol.

Management

- He was managed medically initially which included intravenous furosemide, and oxygen therapy.
- The EDD was 7 days.
- Mr Jones was referred to the dietician who prescribed nutritional supplements.

Physiotherapy assessment

- On initial assessment, Mr Jones was breathless at rest.
- He was cachetic with reduced muscle bulk of the upper and lower limbs.
- Bilateral lower limb swelling was present below the knees and the physiotherapist noted that he had cut the uppers of his slippers.
- Although he was able to move independently from lying to sitting, he was reluctant to stand up and move around.
- Mr Jones reported that he felt very anxious about his breathlessness and also felt that his legs were going to give way if he walked across the bay.
- Mr Jones was worried that he would not be able to manage the stairs at home and dreaded becoming housebound.

Physiotherapy treatment

- Initial physiotherapy intervention included teaching Mr Jones ways of managing his breathlessness and showing him positions of rest.
- As Mr Jones' breathing improved the physiotherapist added a muscle-strengthening programme which included cycling with pedals and functional transfer practice.
- The physiotherapist also referred him to the occupational therapist for assessment of his PADLs and DADLs.
- Mr Jones set his own mobility goals by deciding on a distance that he could walk on a daily basis, with a chair being placed at the distance that he set.
- Initially Mr Jones used a wheeled frame to mobilise across the bay.
- The physiotherapist monitored Mr Jones's heart rate and oxygen saturation during mobilisation and taught him how to self-monitor and pace himself.
- Step-ups were added to the exercise programme.
- By the 4th day of admission, Mr Jones was able to mobilise independently to the toilet with a wheeled frame.

- The physiotherapist reviewed the need for long-term walking aid prescription by assessing Mr Jones in the parallel bars with his stick.
- He was able to walk independently and safely with a stick with occasional touches of the bar for support.
- By the 5th day of admission, the physiotherapist assessed Mr Jones on the staircase in the therapy gym.
- He was able to ascend and descend the steps safely with one rail, but was unsteady when no rails were present.
- The physiotherapist considered that Mr Jones would benefit from the installation of one rail on his staircase at home and liaises with the occupational therapist about this.
- The occupational therapist also prescribed a perching stool, a trolley for the kitchen and a bath-board.
- Mr Jones was also provided information about care-alarms.

Outcomes

- The therapists discussed the progress that Mr Jones had made during his acute stay.
- He felt that he needed some help at home initially as he did not feel confident that he could manage on his own.
- The multidisciplinary team recommended that Mr Jones was discharged with the intermediate care team visiting him at home in order to increase his confidence in his functional mobility and to assess his outdoor mobility once the stair-rail had been installed. A referral to tele-health was instigated by the multidisciplinary team.

Chapter 7 Gerontology multiple choice questions

1. Which of the following is *not* an age-related change in gait?
    a). Reduced hip movement
    b). Reduced gait speed
    c). Change in step width
    d). Reduced ankle movement
2. Which of the following is *not* suggestive of delirium?
    a). No change in level of consciousness
    b). Agitation
    c). Hallucinations
    d). Withdrawal/lethargy
3. Which of the following is *not* a main indication for prescription of a walking aid?
    a). Reduced distal lower limb proprioception
    b). Reducing falls risk
    c). Reduced muscle strength
    d). Pain on weight bearing
4. Which of the following medications can cause postural hypotension?

a). Antihypertensives
b). Diuretics
c). Antipsychotics
d). All of the above

5. What is the most common type of dementia?
a). Vascular dementia
b). Alzheimer's disease
c). Lewy body dementia
d). Frontotemporal dementia

6. Which of the following may be a behavioural response to pain?
a). Agitation
b). Aggression
c). Autonomic changes
d). All of the above

7. Which of the following is *not* amenable to physiotherapy intervention?
a). Muscle weakness
b). Reduced lower limb proprioception
c). Reduced dynamic balance
d). Impaired gait

8. How can exercise intensity be altered in resistance training?
a). Changing the number of repetitions
b). Changing the number of sets
c). Changing the weight used
d). All of the above

9. In order to be effective, balance exercises must be
a). Individualised and progressive
b). Context- and task-specific
c). Challenging
d). All of the above

10. Which sensory and neuromuscular factor has not been associated with evidence-based falls risk factors?
a). Visual contrast sensitivity
b). Muscle weakness
c). Reduced vestibular function
d). Poor reaction time

11. Which of the following balance and mobility factors has been associated with falls?
a). Impaired ability with transfers
b). Impaired ability to stand up
c). Impaired ability when leaning and reaching
d). All of the above

12. Which of the following medical factors are associated with falls?
a). Impaired cognition

b). Stroke
c). Parkinson's disease
d). All of the above

13. Which of the following can be a sign of depression?
a). Fatigue
b). Changes in sleep pattern
c). Loss of interest/participation in hobbies
d). All of the above

14. As part of falls management, the physiotherapist should always:
a). Discuss with the older person how they would summon help in the event of another fall
b). Discuss with the older person how they can reduce the risks of complications of a long lie
c). Check that if the older person has a pendant alarm, that they know how to use it
d). All of the above

15. Which type of exercise programme is not effective in reducing falls?
a). Dynamic balance and strengthening programme
b). Walking programme
c). Tai Chi
d). All of the above

16. How many hours of exercise (within an exercise programme) have been found to be most effective in reducing falls rates?
a). 10 hours
b). 20 hours
c). 40 hours
d). 50 hours

17. Which of the following outcome measures could be used to measure balance ability in a frail older person who is anxious about falling?
a). TUSS
b). Four step square test
c). Berg balance test
d). TURN 180

18. To maximise strength, how many repetitions should be used for each exercise?
a). 5
b). 8
c). 10
d). 20

19. To increase aerobic fitness, an older person should be working at what intensity on a scale of 0–10 where sitting is 0 and 10 is all-out effort?
a). 3–4
b). 5–6
c). 6–7

    d). 8–9

20. If an older person is very anxious about falling when starting to walk, the physiotherapist should always:
    a). Over-consolidate standing before progressing to the next stage
    b). Encourage the older person to practise on their own
    c). Practise walking across the room with the physiotherapist
    d). All of the above

Gerontology multiple choice answers

1. c)
2. a)
3. b)
4. d)
5. b)
6. d)
7. b)
8. d)
9. d)
10. c)
11. d)
12. d)
13. d)
14. d)
15. b)
16. d)
17. a)
18. c)
19. b)
20. a)

Chapter 8

Learning Disabilities

Introduction

- The basis of any intervention when dealing with a person with learning disabilities (LD) is no different from any other physiotherapy intervention, but a different set of skills will need to be developed so as to make the interventions accessible, appropriate for the needs of the individual and enjoyable.
- Failure to ensure this happens may lead to the individual becoming non-compliant, resulting in a poor outcome to treatment interventions.

Treatment planning based on assessment findings

- The assessment as covered in the assessment volume will define the physiotherapy intervention.
- The interventions must be person-centred to meet the individual's needs.
- As described by Barrell (2007), often the identified therapeutic intervention is not appropriate or not acceptable to the person with a LD, e.g. a client may wish to walk without pain and without a walking aid.
- They may not be happy or are unable to follow a specific exercise programme.
- Alternative options will then have to be devised to involve participation of the individual, in order to ensure that they undertake the necessary exercises.
- These options may include Jabadao, aquatic physiotherapy, or suitable leisure activities adapted to meet the needs of the client.
- In addition Barrell (2007) also highlights that the needs of parent carers, carers and support staff must also be considered.
- People with LD are often semidependent or totally dependent on their carers.
- There may be differing opinions between carers concerning perceived needs of the individual and success in delivering treatment is dependent on good communication and understanding of what is required between all involved.
- Assessment results and intervention plans need to be very clearly identified, discussed and communicated between the multidisciplinary team (MDT), the client and carers.
- Interventions tend to be based on exercise that will enhance movement and the client's functional ability.

Types of interventions

- The type of interventions given by the physiotherapist can be divided into the following categories:
  - Advice and signposting
  - Moving and handling advice including treatment handling
  - Specific treatments/interventions, including aquatic physiotherapy, posture management, rebound therapy, Jabadao
  - Management of long-term conditions
  - Health and well being
  - Teaching carers and support staff to carry out interventions, recognise change and to know when and how to contact the physiotherapist.
- The following will describe interventions that are commonly implemented in LD service, taking into account the specific needs of each person with a LD and providing practical tips.
- It may be that the person with LD needs information about or access to community activities such as appropriate gym classes, swimming clubs, walking groups, riding for the disabled, or wheelchair dancing.

Complex handling assessment

- Manual handling is defined as 'transporting or supporting a load (including lifting, putting down, pushing, pulling, carrying or moving thereof) by hand or bodily force' (HSE 2004).
- To the HSE definition may be added guiding, facilitating, manipulating or providing resistance.
- Thus any treatment where force is applied through any part of the physiotherapist's body to any part of the patient, involves manual handling.
- Physiotherapists are often considered the experts in manual handling and as such are often asked to advise on safer handling for an individual.
- However 'Physiotherapists cannot dictate to another profession how to handle a patient.' (CSP 2008), but as the health care professional with the knowledge of the individual's physical presentation the physiotherapist may be best placed to contribute to the risk assessment and to the development of a handling plan for an individual.
- Manual handling techniques as taught in the majority of training situations and described in most of the literature cover a generic handling approach for care staff. Individuals who present with challenging behaviour either physically or behaviourally are a relatively small population and their handling needs may differ from those of the general population.
- Physical challenges may include:
  - Severe spinal deformities and limb contractures, which require the use of specialist

slings
  - Neurological conditions that present with potentially unpredictable movements, e.g. athetosis or severe spasms that may need specific placing of a carer's hands or require specialist equipment or slings to help minimise the risk of injury to staff or the individual
  - Poorly controlled epilepsy, where seizures could occur during a transfer. This can affect the safety of both the individual and carer and the use of any equipment must be considered in respect of this.
- Behavioural challenges may include:
  - Communication difficulties that result in individuals not being able to understand any necessary commands or instructions, which make it unclear how much they will be able to co-operate with a transfer. This may be compounded where an individual has more profound difficulties, e.g. no verbal communication
  - Physical aggression such as hitting out, kicking, spitting
  - Self-injurious behaviour
  - Sensory difficulties, where individuals may be unable to tolerate physical touch, or the close proximity of carers or equipment
  - Verbal aggression
  - Confusion through dementia
  - Confusion as a result of medication.
- Many individuals with a learning difficulty present with a combination of both physical and behavioural challenges. Therefore manual handling advisors, physiotherapists and carers may find themselves with a conundrum to solve, i.e. as the handling needs will generally not be met through a conventional approach, in order to meet the individual's needs appropriately and maintain the safe involvement of all parties involved, there will need to be careful planning of the processes and use of equipment.

Consent

- In relation to any physical intervention, which includes manual handling, individuals have the right to be consulted and involved in the formulation of any 'treatment' and/or care plans that directly affect them.
- If an individual is unable to give consent regarding their handling plans, as in any other situation, a solution must be in their best interests and documented as such, following a multiprofessional discussion.
- A physiotherapist is often called upon in these situations for their advice and recommendations.

Risk assessment

- The law is clear on the duty of employers to fully assess all risks to their employees in

relation to manual handling, where there is the risk of injury; and where there is the possibility of violence or aggression directed towards staff, other clients or any other persons.

- Many individuals who present challenges resulting in complex manual handling situations may also present risks of injury through violence or aggression. Therefore, these clients require greater in-depth risk assessment and detailed management plans in order to reduce the risks to the lowest reasonably practicable level.
- Balanced risk assessment and management plans need to take the human rights of the individual as well as the safety and human rights of the health care staff or carers into account. It is not always possible to have one handling solution that will meet all of the individual's transfer needs. Each transfer situation must be assessed separately with all relevant risk factors taken into account.
- The individual should be involved, where possible, in the devising of safer handling management plans.
- In addition any plans should be devised on a multiprofessional basis, including the care staff who often have the best knowledge of the individual and their behaviours in specific circumstances.
- The risk assessment process should follow the guidelines defined in the Manual Handling Operations Regulations 1992 and subsequent Health and Safety Executive Guidance (HSE 2004). The risk assessment will need to consider risk factors in relation to: the task, the individual capability of the carer(s) carrying out the handling task, the load (individual) and all environmental factors.
- With individuals who present with challenging behaviours, there may be triggers in the environment which could affect their behaviour and influence the handling situation. These must be incorporated into the assessment of the environment along with the other factors such as the height of surfaces or lighting of the area.

Additional risk situations associated with complex handling

- There are often situations where an individual may have to be moved in what would be considered emergency situations in other contexts.
- Plans need to be considered and put into place to manage such foreseeable risks as they often occur in unforeseen circumstances.
- Such situations may include:
  - Emergency removal from adapted wheelchairs for rescue medication
  - An individual taking themselves to the floor while being removed from an environment
  - Moving an individual to a place of safety when they have placed themselves at floor level and are unwilling to assist themselves from the floor, thus placing themselves and others at risk.

- These examples are not exhaustive, but merely serve as examples to emphasise where so-called 'general safer handling guidelines' cannot be applied.
- With complex handling situations, it may not always be possible to reduce environmental or handling risks with the provision of suitable equipment. By introducing equipment other situational risks may be presented. Therefore, alternative methods for managing the situation in the safest manner have to be found.
- The ideal posture and position for performing a particular task may not be possible to achieve, as this could place the carer in a position where they could be the recipient of physical aggression. Therefore, alternative postures and positions may have to be adopted in order to maintain carer safety.
- In such situations, the risk assessor needs to have an in-depth understanding of the presenting behaviours (both physical and behavioural) of the individual, the 'culture' of the organisation and carers undertaking the day-to-day care of the individual and a range of possible solutions to the presenting problems.
- Where individuals pose an additional risk to handlers through challenging behaviours, the behaviours of concern need to be highlighted, including who might be at risk and how. Additionally a record must be made of the details of triggers and situations that are likely to lead to such behaviours being displayed, the probability of such an occurrence, followed by the stages of intervention in the event of such an episode.
- Complex handling plans should only be put in place having been devised around specific individuals in specific situations.
- They should never be used as generic plans to cover all individuals in any situation. It is essential that any carers that are likely to be involved in carrying out the plan are individually assessed for their suitability in carrying out the plan and receive specific training in the techniques required with regular updates.

Recording complex handling plans

- Any safer handling management plan must be documented and be available for all parties involved to read and understand. It is also important that the process through which the decision was arrived at is documented, so that all carers reading the plan are aware of the potential risks involved.
- Recording personal information regarding the ability of carers to carry out the handling task needs to be recorded in individual staff files. This information is confidential and as such should not be recorded on a client's management plan. It is important that staff make their line manager aware of any physical condition that could affect their ability to carry out a safer handling plan.
- A complex manual handling risk management plan must include additional information over and above that which is usually recorded in a handling plan, for example:
  - Basic client details including height and weight where possible and it may also be useful to record the physical stature of the client.
  - The date on which the plan was devised needs to be clear on the front page, so that

carers can see that it is the most recent and up-to-date plan that they are following.

– Details of the specific handling strategies to manage the situation including the minimum number of people to carry out the plan in the safest possible manner.
– The level of individual involvement in the management plan, i.e. whether or not they are able to give consent and where not, the consultation that has taken place with any significant others involved such as family members and the line managers of carers who will be carrying out the plan.
– Any individual or carer needs, such as any specific equipment required, including where it is stored.
– Any specific training requirements for carers.
– The clinical reasoning process that was undertaken to support the handling decision.
– The risks associated with the technique including both risks to the carers and individual.
– Any consequences that may impinge on an individual's human rights should the plan not be carried out.
– The frequency and likelihood of the risk occurring.
– Any action that should be taken following an incident, such as any documentation requiring completion. This may include informing the plan co-ordinators once the plan has been carried out to enable the plan to be reviewed immediately to ensure that all risks were kept to a minimum.
– The signatures of the risk plan co-ordinators.
– The signatures of any significant others who have been involved in the decision-making process.
– There also needs to be an agreement form designed to be signed by all carers to show they have read the management plan, understand the handling strategies and have received any necessary training specific to the handling strategy.
– Any handling plan needs to be reviewed regularly or in the event of any change to the individual's physical presentation or any changes in their behaviour that would affect the handling strategy. A review sheet should form part of the handling plan.
– It is important that if a specific number of carers have been identified in order to carry out the handing plan in the safest manner, that the required number of staff are available at all times in the event of the plan needing to be executed.
– As part of the review process of the handling plan, regular training is essential to ensure that staff remain familiar with the management plan and the required techniques, particularly where they may only be performed occasionally.
– This may involve the compilation of a resource in the form of detailed photographs showing stages of releasing wheelchair straps, footplates or use of other pieces of equipment or where the staff are required to specifically place their hands during implementation of the plan.

Therapeutic handling risk assessments

- Physiotherapists are subject to the manual handling regulations with regard to risk assessments and have a duty to reduce any risks involved to the lowest reasonably practicable level (HSE 2004). Many physiotherapists carry out risk assessments as part of their ongoing assessment process, but it is important that this information is written in the individual's clinical notes and does not remain as a series of thoughts in the therapist's head. Implicit in the legislation is the requirement to record the risk assessment and any planned risk-reducing methods. If this information is not written down, it is considered never to have been carried out, and in the event of a handling incident occurring, a physiotherapist's memory of what was assessed and what was planned would not be considered robust evidence in a court of law should an individual seek to establish negligence and gain compensation for any harm incurred during the handling process.
- The handling risks that physiotherapists are exposed to differ from those of general care staff, as they are involved in the re-education and rehabilitation of individuals and without any intervention, many people may never progress and regain function.
- Due to the complex physical presentation combined with challenging behaviour, physiotherapy programmes may present additional challenges. Added to this, certain treatment modalities used may inherently introduce an added risk of an incident occurring, for example during rebound therapy there is added risk from the unstable surface and the poor postures required to position individuals on the bed of the trampoline.
- There are many examples of different ways to record treatment handling risk assessments. An example of this designed and developed by the All Wales Treatment Handling Group is available to physiotherapists as an appendix to the guidelines on manual handling produced by the Chartered Society of Physiotherapy (CSP 2008).
- It is important to examine treatment goals and the methods decided upon to reach those goals. The question should be asked, 'Is hazardous handling involved?' If the answer is in the affirmative, it may be necessary to consider alternative treatment methods, or introduce equipment to reduce risks or even to reconsider treatment goals in conjunction with the individual explaining any reasons why.
- Clinical reasoning must be documented to explain why a particular intervention has been decided upon. The physiotherapist must consider their own health in relation to the ability to implement the treatment safely and also the safety of any person assisting them. For example, can the physiotherapist or any assistants, safely achieve prolonged knee flexion should it be required?
- Any particular risks associated with the individual being treated must be recorded. With adults with a LD this could include any behavioural challenges, uncooperative behaviour, unstable epilepsy, as well as poor sitting ability, tendency to drop to the floor or involvement of particularly heavy individuals or their limbs that require handling.
- Environmental risks must be recorded, such as height of bed may be an issue if working

in an individual's home, a potentially noisy or busy environment if treatment is taking place in a day centre.
- It is important to record any risk-reducing measures, such as an increase in staff, the introduction of equipment, a third person following behind with a wheelchair if assisting an individual to mobilise.

Delegation and advice

- Within the field of LD, physiotherapists may frequently find themselves delegating all or part of a physiotherapy programme to carers.
- It is important to be clear whether advice is being given or a specific task is being delegated to another.
- Recording must always be made of the names of individuals the task has been delegated to and any advice given.
- A task should be observed on more than one occasion having been delegated to a carer to ensure the carer is clear on the reasons for the intervention, any risks involved, any reasons why the programme should not be carried out and that the physiotherapist is confident that the carer can carry the intervention out safely.
- Clear written instructions should be issued making sure that they are understood. It is important to remember that no assumptions should be made about people's level of comprehension or ability to read written instructions. These instructions can be complemented with the addition of photographs.
- It must be remembered that if the physiotherapist asks employed carers to carry out part of a physiotherapy programme, it may not be their priority to carry out that task. They are employed as carers and therefore their priority will often be to ensure the individual has assistance with personal care if required, participates in activities of daily living and accessing their local community. They may not make time to carry out a programme of physiotherapy. Where possible, programmes should be incorporated into activities of daily living, such as active assisted movements that can be incorporated into washing and dressing; balance work in sitting or standing can take part during mealtimes or while washing up.

Aquatic physiotherapy

- Aquatic physiotherapy is a frequently used modality of treatment for adults with a LD and it is a welcome medium for interventions providing freedom of movement for individuals with PMLD with the warmth of the water allowing the relaxation of muscles that are affected by increased tone.
- Refer to the aquatic physiotherapy assessment and treatment chapters for details on the principles of treating people in water.
- Many clients with a LD experience epileptic seizures, are PEG fed and doubly

incontinent, all of which in some pools may be considered a contraindication to aquatic physiotherapy.
- A thorough risk assessment is necessary as these risks need not exclude an individual from accessing a pool.

Rebound therapy

- Rebound therapy is the therapeutic use of a trampoline and it is widely used as a treatment modality within LD.
- It can be used for any manner of ability/disability. For example:
  - It can be used as a stepping stone for the more physically able to access the sport of trampolining.
  - For those that will not progress to integrated sports, it can be a valuable weight-reducing activity that is fun.
  - It may also help with balance, co-ordination and concentration levels.
  - This use of a trampoline may not require the skills of a physiotherapist and may be led by a special needs trampoline coach.
  - It can be used to reduce the energy levels of some individuals. Some of these may have challenging behaviour so any participation in rebound must be fully risk assessed for its outcome and the potential risk to individuals and coaches.
  - Floor access trampolines may present less of a risk in mounting and dismounting for these individuals.
  - It can be used therapeutically for mobile individuals who have some neurological impairment. The trampoline can aid with improving someone's balance, core stability and co-ordination while giving them a challenging and unstable base to work from.
  - For individuals with PMLD it is a vital mode of delivering physiotherapy. It is especially beneficial if individuals are tactile defensive or their tone is so high that it is difficult to carry out passive movements in a pain-free manner.
  - In this instance rebound therapy is much like an aquatic therapy pool in that the bounce of the trampoline will give the benefits in the same way as the warmth of the water will without the need for hands-on physiotherapy intervention.
- Rebound, like many physiotherapy modalities, does not lend itself well to quantitative forms of research. Therefore, much of the research available is of a qualitative nature where physiotherapists have highlighted some of the benefits observed clinically when using Rebound.
- These include:
  - The reduction or recruitment of muscle tone depending on the need of the individual and the depth of the bounce produced on the trampoline.
  - Stimulation of bladder and bowel function.
  - Stimulation of the respiratory system – for those individuals who have a propensity

to chest infections and who cannot produce an effective cough on demand, the trampoline can be an effective way of stimulating a cough. This is by either the general movement or by using bigger bounces which can force air into the lungs and thereby stimulate a cough.
  - Sensory stimulation.
  - Rebound has an important function to play in postural management when gravity can be used to improve posture rather than be destructive.

Restrictions and contraindications

- Manual handling is the main limitation for rebound due to the unstable and moving base the physiotherapist is working on.
- The physiotherapist must ensure that staff can safely assist the individual on and off the trampoline. This may be independently or with assistance. The latter may be just verbal and/or physical prompts or may refer to hoist transfers.
- Contra indications do exist and must be observed.
- The Chartered Society of Physiotherapy (CSP) has produced a guidance paper for physiotherapists using rebound in practice which encompasses the contraindications (CSP 2007). In addition the interactive forum of the CSP (iCSP) is a useful discussion forum where physiotherapists can share practice issues and good practice with other physiotherapists already using this mode of treatment.
- Rebound therapy can be an invaluable tool in any physiotherapist's repertoire and it may be used widely within learning disabilities.
- Rebound should not be limited to the LD patient group, as the benefits can be applicable for patients with a variety of neurological conditions.
- Rebound also makes therapy 'fun' and provides an alternative to the physiotherapy gym, which can ensure that there is something additional to maintain the interest of the individual in their treatment, when it can be difficult to maintain the incentive in long-term rehabilitation.

Splinting in LD

- Splinting may be seen by many physiotherapists as the domain of the occupational therapists, but for long-standing neurological conditions, such as those that are associated with individuals with LD, cross therapy working is essential.
- The use of splinting is contentious and many neurological physiotherapists argue against the use of splinting for patients with acute neurological conditions.
- However, where the neurological damage is long-standing, splinting may have a part to play in preventing further deterioration of asymmetrical postures or small joint contractures and deformities.
- Adult PMLD individuals may not have volitional movement in their upper limbs and as

such LD physiotherapists work with a number of individuals who have developed contractures, particularly of the hands.

- The cause of the contractures may be attributed to increased muscle tone in combination with the effects of gravity.
- The effect of this can lead to anatomical structures tending to 'slip and slide' and can result in deformities similar to those seen in rheumatoid arthritis, such as 'swan neck' and 'Boutonniere' although the mechanism by which they develop is very different.
- Due to the way that physiotherapy intervenes in LD the physiotherapist may become aware of the need for intervention in order to maintain joints in a neutral position as far as is possible.
- Resting splints, functional splints and serial splinting are all possible interventions that can be utilised.
- However, in advanced neurological conditions splinting may have to accommodate any deformity that may already present.
- Splints may be used in an attempt to alter long-term deformity or they may be just as importantly arresting the deformity from deteriorating further.
- The provision of a splint may seem to be for cosmetic reasons, for example in the case of finger flexion contractures. However the tendency for an individual's nails to dig into their palm may lead to the breakdown of the skin and a resulting infection. The use of palm protectors is a simple but effective way of preventing unnecessary complications due to contractures.
- For the provision of splints there may be joint working between a neurologist, occupational therapist, orthotist and physiotherapist. Many neurologists will only administer Botox injections when splints are in place to maintain any increase in joint range of movement that may be achieved as a result of the treatment.
- Therefore, splinting may not be a modality that every physiotherapist participates in, but for student and junior physiotherapists, every opportunity should be taken to gain an insight into this area of work.
- Knowledge of the principles of splinting and how splints can be provided for an individual will ensure that outcomes from intervention will be improved.

Postural management

- Postural management is the maintenance of optimal physical position.
- Ideally posture management should occur over a 24-hour period.
- The majority of individuals with PMLD experience the constant fight between gravity and the opposing up-thrust from their supporting surface.
- Humans with normal postural tone are able to support themselves against these forces to maintain an anatomically correct posture. Within these parameters, individuals can move effectively and efficiently without conscious thought of these opposing forces.
- Individuals with altered muscle tone are unable to maintain a stable, energy-efficient and

functional posture and this can lead to damage of anatomical structures.

- As a result of the abnormal tone contractures and deformities often develop.
- Secondary complications that can occur in association with tone abnormalities can include:
  - Spinal deformities
  - Respiratory incompetence
  - Gastrointestinal compromise
  - Swallowing issues and dysphagia
  - Pressure areas
  - Contractures
  - Pain/discomfort
  - Poor maintenance of weight.
- Conventional positioning, such as most chairs, requires an individual to sit with their hips at a right angle or close to it.
- If an individual has decreased range of movement at the hip joint that prevents them from achieving 90° flexion and the seating provided expects them to do so; their body will accommodate to allow them to be seated. With the example mentioned of reduced hip flexion, this will lead to rotation and/or deviation of the pelvis and development of a scoliosis.
- Therefore, a thorough assessment of the range of movement available at critical joints is essential. This then provides a framework to liaise with seating engineers to provide a suitable wheelchair insert.
- The seating design needs to accommodate an individual's limitation of movement and must allow them to be seated with a stable base, without expending energy to maintain their position and without causing tissue damage.
- Pauline Pope has written a book and produced additional material that provides a comprehensive yet readable narrative regarding posture and its management (Pope 2006).
- Noreen Hare developed resources for evaluating and managing postural deformities and these can be accessed via http://hafpa.info/.
- The responsibility of a physiotherapist does not only involve providing advice around the types of wheelchair seating available, it extends to every aspect of an individual's life, for example, their position at night time and alternative comfortable seating and for any time that they spend out of their supporting wheelchair.
- The physiotherapist will need to liaise with different providers of specialised equipment and be able to co-ordinate the assessment and provision of equipment and its funding.
- The physiotherapist's role also includes the education of carers, family members and care staff in the different environments that an individual accesses on a regular basis. This is important as the maintenance of optimum posture involves everybody that is involved in supporting the individual over a 24-hour period.

Clinical case example A

Background

- CJ is a 40-year-old lady with a diagnosis of cerebral palsy.
- She weighs approximately 9½ stone and spends much of her time in a wheelchair which has a moulded insert.
- CJ also has the use of a specialist armchair both at home and in day services.
- CJ lives at home with her parents where she has an adapted en-suite bedroom. There is overhead tracking through to the bathroom where there is an adapted bath and in the bedroom she has an electric profiling bed.
- Physically she presents with a gross kyphoscoliosis with the curvature convex to her left side.
- She had generally increased muscle tone and flexor contractures were present in her upper limbs.
- She had a marked windswept deformity of her hips to the left with a resultant reduced range of hip movement.
- Both of CJ's knees were fixed in knee extension.
- Harrington rods had been inserted into her back in an attempt to control the scoliosis in her late teens and these had gradually been bent due to the force generated through the muscle spasms she experienced.
- The spine is monitored on a regular basis in the local orthopaedic department and regular X-rays are taken in order to rule out breakage of the rods due to metal fatigue.
- CJ experiences regular myoclonic jerks and frequent absences as well as occasional tonic-clonic seizures.
- She has no verbal communication, but is able to demonstrate pain and discomfort although it is not always easy to differentiate between seizure activity and discomfort.

Historical handling practice

- Since she was a child CJ's father has lifted her for all transfers.
- Over the years it has been the role of the physiotherapists supported by other team members to educate the father about the hazards of manually lifting his daughter in the way that he had been used to.
- It took a great deal of persuasion before he would accept the provision of the handling equipment to make it safer and easier to manage CJ.
- In day services a hoist and full sling was used for all transfers, but a modified draglift was used to place and remove the sling.
- The modified drag lift presented a risk to the carers because of the postures required to undertake the task, i.e. bending into flexion with a twisted spine and having to support

CJ's body weight.
- This position effectively meant that CJ was being handled away from the carer's base of support adding to the increased risk.
- Handling CJ from under her armpits and pulling her weight forward by this method also placed repeated stresses and strain on her shoulder joints leading to undoubted pain, discomfort and potential damage to the joint structures. CJ was unable to verbally express this.

Solution

- CJ was assessed for and provided with a specialist all-day sling, which accommodated her spinal deformity.
- This was designed so that it could be left in situ behind her in her wheelchair and armchair.
- The previous manual handling that was involved in inserting and removing the sling was eliminated.
- Subsequently the sling could be placed in position in the morning by her father with CJ lying on the bed by rolling her onto the sling.
- The sling could be repositioned in the same way when necessary following personal care by the carers.
- Carers that were carrying out unsafe practice by using a drag lift were given some education on the risk that this manoeuvre posed to their health and the potential for damaging CJ's shoulders (Carayon 2007, Hignett et al 2003).

Clinical case example B

Background

- A is a 46-year-old male who lives in 24-hour staffed accommodation.
- He has cerebral palsy and severe LD.
- A has verbal speech, but this tends to be in the form of 'catch' phrases that he has learnt over the years.
- Despite his speech limitations A is able to hold quite a sociable conversation.
- A's only purposeful movement is of his head and some of his upper limbs.
- He can exhibit a startle reflex, but this same movement can be set off when he is unsure or anxious.
- A is wheelchair-dependent and requires hoisting at all times.
- He has a moulded wheelchair, which has a tilt in space base.
- He uses a leave under sling at all times to reduce the manual handling for both A and the staff, but also as part of his 24-hour postural management plan.

- He has a specialised postural armchair and a profiling bed.
- On his bed he uses parts of two different postural management sleep systems.
- The posture management systems are in place when he is resting on the bed and also at night when he goes to sleep.
- His LD physiotherapist has provided him with a variety of splints.
- These mainly consist of hard thermoplastic hand splints and also soft palm protectors for both hands.
- The different splints have been provided in order to try to accommodate the asymmetric posture of both of his hands.
- A is able to carry out some functional tasks with his right hand, but there is no functional ability in the left hand.
- The position of both hands is one of flexion and ulnar drift with flexion at the metacarpophalangeal joints (MCPs).
- The fingers have a lax feel and tend to exhibit both swan neck and boutonnières deformities.
- His current physiotherapy input is weekly for passive movements and rebound therapy.
- Hydrotherapy would be advantageous, but no facilities are currently available within a practical distance of his living accommodation.
- His splints and wheelchair are reviewed as required.
- Staff training is also carried out in regards to the passive movements he requires and his 24-hour postural management needs.

Challenges

- Staff were carrying out unsafe practice by using a drag lift (Carayon 2007, Hignett et al 2003).
- A is able to verbalise his thoughts and needs, but it is difficult to ascertain his capacity to consent.
- A is a very dominant character and likes to think of himself as being 'kingpin' in his own house and as such is in charge of everyone's whereabouts, including his co-tenants. In order to enable him to feel that he is in control of the house A likes to stay within the kitchen.
- If this doesn't occur he can become verbally aggressive and use very abusive language.
- The volume and intensity of this will increase and he will threaten to report staff for neglecting to observe his wishes.
- This behaviour has arisen when staff have taken him to lie on his bed to have a change of position or to change the splints on his hands.
- This situation has been improved somewhat by the purchase of the postural armchair, but there remained an issue with the fitting of the hard splints.
- Staff were initially prepared to persevere with the fitting of these as the physiotherapist had requested them to be applied.
- However, the staff felt that the abuse was unacceptable and after discussions between the

physiotherapist and the whole staff team it was decided to stop the use of the hard splints for the time being and to continue with the soft splints.

- This was quite a compromise as A's hand shape had been improving with the daily use of the hard splints.
- It is hoped that they can be reintroduced at another time; however, in the interim the soft splints are being tolerated and are also maintaining his hand function and position, if not to the same degree as the hard splints.
- A will regularly tell staff that his physiotherapy sessions are cancelled; although when he attends he appears happy to be there.
- The other main challenge to his LD physiotherapist is that despite A having all the postural equipment that he should have in place his posture continues to deteriorate. His weight is more than it should be, but this has been stabilised at the moment with the care staff following a healthy eating menu and in addition they have reduced his portion size.
- However, his trunk is still following a more flexed pattern, but more troubling is that his trunk has also started to take on a rotational deformity.
- His head has begun falling forward and to the side, which he is becoming less able to correct. This not only affects his communication, but it also results in his saliva pooling on his cheek and causing a skin irritation and sometimes dental abscesses.
- The trunk rotation force is the hardest deformity to correct and even though the tilt facility is used to position him in his wheelchair and postural armchair the amount of rotational deformity is becoming worse.

The future

- For the LD physiotherapist this will involve working closely with the wheelchair engineers that are responsible for the production of A's wheelchair to try to build a corrective mechanism into the chair design.
- The concerns of the physiotherapist need to be discussed with the neurologist responsible for A's medication.
- The care staff need to be provided with support to help them to deal with A's changing physical presentation and this includes manual handling and positioning advice.

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Chapter 8

E-materials

Author profiles

Nicola Harmer GradDipPhys MCSP

Nicola has worked with adults with learning disabilities for the past 20 years in South Wales. In 2001 she became the manual handling advisor for the Directorate of Learning Disability Services, Abertawe Bro Morgannwg University Health Board and was a contributor to the development of the manual handling guidance published by the Chartered Society of Physiotherapy in 2008.

Sue Standing MSc MCSP

Sue is a specialist physiotherapist working with people with learning disabilities and profound and multiple learning disabilities (PMLD). Sue worked for 14 years in special schools developing skills in assessment, posture management and aquatic therapy (hydrotherapy).

Sue set up services for adults with LD in Spelthorne before moving to Southampton to support the closure of the long-stay hospital and develop community physiotherapy services for the clients in Southampton and Hampshire.

Sue gained a Masters Degree in Applied Psychology (LD) in 1996 and her service was nominated for a Health Social Care award in 2001.

Sue has been an active member and Chair of the ACPPLD and has contributed to several

text books on the subject of physiotherapy for people with learning disabilities. Sue is an expert witness for people with LD and has worked as honorary Physiotherapist to the Rett Association.

Andrea Hounsell MSc BSc(Hons) MCSP

Andrea is a Physiotherapy Team Leader in the Learning Disability Directorate of the Abertawe Bro Morgannwg University Health Board.

Andrea has worked in learning disability services in the Cardiff area since 1993. During this time she has been involved in many developments within this field.

Andrea has always taken a keen interest in clinical education. As such she takes part in undergraduate education on learning disabilities at the Cardiff School of Physiotherapy.

Case Study 8.1

Background

- Ian was a young man with profound and multiple disabilities.
- Ian had a moulded wheelchair insert, which was used mainly for transport, as he was

unable to tolerate the corrected position for long.

- Much of his time was spent in a fixed-height reclined armchair.
- Physically he presented with:
  - Gross kyphoscoliosis, concave to the left, compromising his left lung
  - There was severe impingement of his left pelvis under his rib cage
  - Both hips were windswept to the left
  - 19 years ago he had a right Girdlestone's operation and the position of the top of his right femur was undetermined, but was suspected to have migrated upwards and to be sitting somewhere posteriorly under his sacrum
  - Both upper limbs were held in flexion with a degree of external rotation
  - His head was held in fixed left rotation and some extension
  - He had poor head control
  - His lower limbs had minimal flexion at his hips and knees bilaterally
  - Ian had a body weight of 3½ stone (22 kg).

Transfer issues

- There was a report in Ian's physiotherapy and day service notes recommending that he was not to be transferred using a hoist as it could have a detrimental effect on his breathing.
- There was an additional statement from a consultant neurologist stating that a manual lift would be most appropriate due to Ian's spasticity levels.
- The existing handling plan stated that one person lifted Ian for all transfers.
- Carers were reporting that lifting Ian had become increasingly difficult, although the reasoning behind this was difficult to pinpoint.
- The handling plan was initially changed to a co-ordinated 2-person lift while assessment was undertaken to define the types of specialist slings appropriate for Ian's needs.

Problems identified with the standard slings

- Ian's trunk was insufficiently supported, as the lifting points on conventional slings are at hip and shoulder level, which encouraged too much flexion at his hips for him to tolerate, i.e. encouraged a 'jack-knife' position.
- Due to the 'closed' position of conventional slings and the fact Ian's head was fixed in left rotation, his nose was compressed against the sling, preventing him from breathing.
- Insufficient head support.

Assessment for a specialist sling

- It was thought that the statements in Ian's records regarding the hoisting may have

stemmed from the early days of hoist transfers when all slings were the same design and probably were unsuitable.

- Specialist slings were required that had the following characteristics:
  - A more open position that would not compromise Ian's hips.
  - Increased lifting points, at shoulder, hip and thigh level, to provide increased support for Ian's whole body in a reclined position.
  - Separate supports at each thigh to accommodate the different thigh lengths and hip pathology.
  - That enabled Ian to continue to breathe nasally during a transfer, i.e. had a hole level with his nose that would also provide some head support.
  - Stretcher spreader bar to support Ian in his preferred lying position.

Introduction of hoisting

- The carers were initially reluctant to assist Ian with transfers using a hoist because of the well established myth that Ian could not be hoisted.
- The specialist sling was trialled initially by a physiotherapist and 2 manual handling advisors in order to determine the effect on Ian's breathing and pain levels by observing his facial expression.

Outcomes

- Use of the hoist and specialist sling was successfully trialled, gradually incorporating the carers into its use.
- Written instructions and photographs were provided for the carers to assist them with the positioning of Ian in the sling and where to attach the loops of the sling onto the spreader bar.
- Despite the initial reluctance Ian's carers were able to observe the hoisting process and became convinced that they could continue this as the method of choice when transferring Ian.

Case Study 8.2

Background

- Mary is a 48-year-old female who has cerebral palsy and LD.
- She lives in 24-hour-staffed accommodation.
- She has no verbal speech and uses Signalong for communication.
- Mary is wheelchair-dependent and requires hoist transfers at all times.

- She has fixed flexion deformities of her hips and knees.
- Her knee position makes it difficult for her to keep her feet on ordinary footplates in her wheelchair.
- Mary has some functional movement of her upper limbs, which enables her to self-feed and hold a cup.
- She is unable to assist with dressing.
- Mary has a lot of extensor thrust, which she occasionally uses purposefully to reposition herself, but she also tends to use this as part of her unwanted behaviours.

Identified problems

- Mary spent a period of time in a nursing home following the death of her parents. During this time her weight increased as the staff used food to placate her.
- Added to this was increasing frustration at her isolation.
- Her posture within her wheelchair had deteriorated quite dramatically.
- These issues could not be resolved until she moved into staffed accommodation; even then they took some time to be resolved due to the waiting list for the wheelchair service provided by occupational therapy.
- Mary's challenging behaviour manifested itself in episodes of crying and then screaming.
- The volume and intensity is such that she can be heard outside the house quite easily.
- She is inclined to pinch and grab at anyone close to her.
- In addition she tends to use the extensor thrust, which in the past has resulted in her sliding out of her wheelchair. The lap strap on her wheelchair has been changed so that she is unable to undo it herself.
- Staff have to use a ballpoint pen to release the clip.

Treatment strategies

- Staff within the supported accommodation were intensively trained along with Mary in Signalong, as some of the signs that she had previously used were unique to her and her family and their details had been lost on the death of her parents.
- This side-by-side learning helped to alleviate the communication difficulties for the staff needing to know what Mary was asking them.

Therapy

- Initially when she moved into the staff accommodation her behaviours were centred around her wheelchair, as she was clearly uncomfortable and at that time had no alternative seating.
- When she became uncomfortable or tired she was obliged to either go to bed or stay in the wheelchair and sit in the lounge.

- Mary's attendance at activities or therapy, which included hydrotherapy and rebound, was mood-dependent.
- She was provided with an All-day sling to help with the repositioning in her wheelchair.
- This reduced the amount of general manual handling as her lack of trunk flexion made placing a sling behind her very difficult.
- In addition, the provision of the All-day sling minimised the risk of Mary being able to pinch staff during transfers.
- The LD physiotherapist assessed Mary for alternative seating and a postural armchair was provided, meaning that she had a suitable alternative and comfortable seat, which could be moved from room to room.
- Despite the changes Mary continued to have regular bouts of crying and screaming, which meant staff were unable to interpret her requests.
- At these times Mary was given the option to stop or be removed to her bedroom.

Ongoing physiotherapy input

- This will continue to be ongoing in weekly rebound therapy and hydrotherapy sessions as her moods allow.
- There will be regular review of Mary's wheelchair and general postural management. Support will be provided for home staff who may require further advice on manual handling or other issues.

Case Study 8.3

Background

- Sandra is a 23-year-old woman with athetoid cerebral palsy.
- She weighs 5½ stone (34 kg).
- Sandra has no verbal communication, but has very expressive facial expressions and can indicate pain or pleasure.
- She lives in supported accommodation with 24-hour support and attends Day Services 5 days a week.
- Physically she does not have any spinal deformity, but presents with typical athetoid movements of both upper and lower limbs.
- Tonally, she fluctuates between high and low tone.
- Her joints are generally lax.
- Sandra used an adapted wheelchair with thoracic supports.
- There was a chest harness provided to further support her trunk in an upright posture, a pelvic strap to maintain her pelvic position and foot straps on the wheelchair footplates to minimise lower limb extension, which led to global extension if her feet were left free

and unrestricted.
- Sandra had uncontrolled epilepsy and required rescue medication in the form of rectal diazepam at the onset of any seizures in order to prevent status epilepticus.
- Her typical seizures were tonic-clonic.

Risk assessment

- It was necessary to have a clear understanding of what happened when Sandra experienced a seizure in order to devise a management plan to enable her safe removal from her wheelchair to facilitate the administering of the rescue medication.
- During a seizure her body was described as going into global extension, being strong enough to potentially lead to a fracture or dislocation of her lower limb joints, due to her being fixed in the wheelchair with straps.

Reasoning

- A hoist transfer was not considered an option as she may have incurred an injury by impacting against the body of the hoist.
- In addition, because the rescue medication was required at onset of seizure, it was thought to be unlikely that a hoist would be immediately at hand to assist her from her wheelchair.
- The consensus view was that Sandra would need to be physically lifted from her wheelchair due to the life-threatening nature of the situation despite manual handling guidance that individuals are not to be routinely lifted.
- A multiprofessional meeting was held with the health team including the prescribing consultant and Sandra's father in order to consider the issues presented by the recommendation to carry out a physical lift.

Process

- In order to reduce the risk associated with lifting Sandra a specialist all-day sling was commissioned. This had strategically placed 'carry handles' at shoulder and hip level.
- It was left in situ behind Sandra in her wheelchair, so it would be available in an emergency as well as for other transfers.
- The sling incorporated a strap around her trunk in order to ensure that it would remain close to Sandra during any lift.
- A specific order was defined for the release of the wheelchair chest harness, pelvic strap and foot straps.
- In the event of the foot straps being released first, Sandra would go straight into extension, which would prevent the release of the pelvic strap.
- Photographs were taken of each stage of the lift, including positioning of the carers,

release of the straps and hand placements on the sling.
- This was reinforced by simple written instructions covering each stage of the process.
- The material was developed as training material, so the carers could refer to it on a regular basis if Sandra went for a prolonged period without having a seizure.

Outcomes

- The risk assessors who devised the plan were informed on each occasion that Sandra had a seizure.
- This was to enable evaluation of the process and amend it if required.
- The plan was carried out successfully on a number of occasions and neither Sandra nor any of her carers sustained any injuries during its implementation.

Addendum

- Sandra underwent a percutaneous endoscopic gastronomy (PEG) for eating and drinking difficulties and following this her seizures became more controlled.
- In addition buccal midazolam was introduced as an alternative rescue medication, which did not require Sandra to be removed from her wheelchair for the administration.

Chapter 8 Learning disabilities multiple choice questions

1. What are the criteria for someone to be labelled 'learning disabled'?
   a). Unable to achieve 5 GCSEs
   b). Dyslexic
   c). IQ below 70, unable to carry out aspects of daily living independently
   d). Acquired brain injury affecting all aspects of daily living
2. Which of the following pieces of legislation will benefit individuals with LD least?
   a). The Mental Health Act 2007
   b). The Mental Capacity Act 2005
   c). The Disability Discrimination Act 1995
   d). Carers and Disabled Children's Act 2000
3. What does MDT stand for?
   a). Mechanical delay transfer
   b). Mental deficiency treatment
   c). A common term for manic depressive treatment
   d). Multidisciplinary team
4. When delegating a physiotherapy task to carers, you should gain the consent of:
   a). The client's parents
   b). The carers and the client's family members
   c). The client and all carers who will be undertaking the programme
   d). Members of the MDT

5. What does MCA stand for?
    a). Medical crisis alert
    b). Mental Capacity Act
    c). Medical Compliance Act
    d). Movement criteria assessment
6. Under what circumstances should a 'best interests meeting' be held?
    a). When family and carers are unable to agree on a plan of action
    b). When the professionals involved are unable to reach a consensus
    c). When the individual does not have the capacity to decide major life decisions for themselves
    d). When the individual is confused about a decision
7. What does SOVA stand for?
    a). Safeguarding of vulnerable adults
    b). Safeguarding of violence and aggression
    c). Social outcomes values approach
    d). Safety of vehicle analysis
8. What type of hoist and sling might you consider recommending for an individual who is wheelchair-dependent, requires physical assistance for all transfers, and is able to weight bear?
    a). Hoist and full sling
    b). Hoist and dress sling
    c). Standing hoist
    d). Ceiling tracking hoist
9. What type of hoist and sling might you consider recommending for an individual who is wheelchair-dependent with a moulded insert, windswept deformity of the hips and fixed kyphoscoliosis?
    a). Hoist and specialist sling
    b). Standing hoist
    c). Hoist and dress sling
    d). Poolside hoist
10. What does PMLD refer to?
    a). Profound and multiple learning disability
    b). Postural management for people with learning disability
    c). People with multiple learning disabilities
    d). Profound movement and limb disorder
11. What is a disorder of swallowing?
    a). Dysarthria
    b). Dysphasia
    c). Dystonia
    d). Dysphagia
12. What chromosome is affected in Down's syndrome?
    a). 29

b). 26
c). 21
d). 31

13. What problems do individuals with Prader–Willi syndrome experience?
a). Climbing stairs
b). Negotiating obstacles within a home environment
c). Difficulties with spatial awareness
d). Difficulties in controlling food intake

14. What does the term postural management mean?
a). Assisting an individual to maintain an optimum posture over a 24-hour period
b). Use of a straitjacket for periods of time during every day
c). Ensuring an individual sits appropriately
d). Providing equipment to assist an individual to sleep in an optimum position

15. Who is responsible for ensuring an individual has appropriate wheelchair seating?
a). Carers
b). The physiotherapist in isolation
c). The occupational therapist in isolation
d). Liaison between the physiotherapist, occupational therapist, wheelchair services and seating engineer

16. What is the difference between an OT and a physiotherapist?
a). One wears bottle green and one wears navy uniform
b). One does crafts and the other does sports
c). Physiotherapists regain range of movement and muscle power and OTs use this to regain purposeful function
d). One does manipulation and the other issues equipment

17. Why were the long-stay institutions closed?
a). Expense
b). Socially unacceptable
c). People have the right to live a normal life
d). The land was needed for houses

18. What reasons can an individual not access a hydrotherapy pool?
a). Double incontinence
b). PEG
c). Epilepsy
d). Open wound

19. What's pica?
a). Compulsive habit for eating anything
b). People in community accommodation
c). Profoundly independent challenging adults
d). Chromosomal disorder affecting chromosome 7

20. What does LOLER stand for?
a). Limitations of lifelong epilepsy risks

b). Lifting Operations and Lifting Equipment Regulations
c). Lots of little endemic rituals
d). Lifting of Large Equipment Regulations

Learning disabilities multiple choice answers

1. c)
2. d)
3. d)
4. c)
5. b)
6. c)
7. a)
8. c)
9. a)
10. a)
11. d)
12. c)
13. d)
14. a)
15. d)
16. c)
17. c)
18. d)
19. a)
20. b)

Chapter 9

Medicine

Introduction

- For the student or novice physiotherapist commencing work on a medicine ward they may be wondering 'what conditions will I see?' and 'what is the treatment approach I will be expected to follow?'
- There is no 'recipe' book of treatments that covers every diagnosis or presentation encountered on an acute medical ward and the specific treatment interventions. The aim of this chapter is to indicate the types of assessment approaches that may be used and how these enable the therapist to choose the appropriate interventions.
- The authors anticipate providing the reader with an insight into the role of the physiotherapist in the medical management of patients, the hospital multidisciplinary team (MDT), professional documentation, discharge planning and on-going referral.
- By understanding the role of physiotherapy within acute medicine the reader will be able to make their own conclusions about what working in medicine as a physiotherapist entails.

Admission to an acute medicine ward

- The reasons for admission to a medical ward are varied with each patient's presentation having associated medical issues. Each patient seen by a physiotherapist on a medical ward will be different and will need to be approached as an individual.
- Even a similar diagnosis will not guarantee that a patient will present in the same way and this will mean that they will require a different approach from the MDT and the physiotherapist.
- The diagnosis may not necessarily directly influence or dictate physiotherapy intervention; however, it is important in relation to an individual's prognosis in terms of the course of the condition, life expectancy, possible fatigue, impact cognition, physical ability. All these factors could then influence the decisions to be made regarding the rehabilitation potential or discharge destination, e.g. home, residential or nursing home.
- The variation of presentations/diagnoses to be encountered should not be viewed as a daunting or intimidating prospect, if the physiotherapist has confidence in the assessment findings and reasoning associated with this.

Assessment and goal planning

- The most fundamental thing to remember above everything else is that the assessment should, and needs to, identify the problems that physiotherapy treatment intervention can where possible, work towards resolving or reducing them.
- Equally important is ensuring that the assessment findings and subsequent treatment intervention are defined as a result of patient-related goal planning, which includes inclusion within an MDT framework.
- Talking to some patients about goal planning and it may be difficult to engage them. However, talking about what they feel they need to achieve in order to return home may stimulate a different and far more enthusiastic response.
- It may seem obvious, but it is worth emphasising that both the physiotherapy and the overall MDT intervention goals should be focused on the patients' needs as defined by them, rather than what 'we' as professionals consider should be the outcomes.

Patient demographics

- The type of patient being admitted to an acute medical ward has changed significantly over the years, not surprising if the changes in population demographics are considered.
- The UK has a population that has been aging over the last 25 years, with the percentage of the population aged 65 and over increasing from 15% in 1984 to 16% in 2009, an increase of 1.7 million people.
- The most potentially influential statistic is that the fastest population increase has been in the number of people aged 85 and over, the 'oldest old'.
- In 1984, there were around 660 000 people in the UK aged 85 and over. The total number has more than doubled, reaching 1.4 million in 2009.
- By 2034 it is projected that the number of people aged 85 and over will be 2.5 times larger than in 2009, reaching an estimated 3.5 million and accounting for 5 per cent of the total population (ONS 2010).
- Considering these significant demographic changes it is suggested that more services will be required within the local health community to manage the associated health needs of this population.
- The way in which these services are delivered will continue to change as more patients are managed in primary care settings rather than the secondary care that is commonplace in present day service delivery.

Profile of patients on medicine wards

- Physiotherapists working on a medical ward are likely to encounter patients with complex medical, physical, social and emotional needs that can no longer be managed safely and effectively within the community resources.

- Patients admitted to hospital from the community require a co-ordinated MDT assessment in order to ensure that they and their family/carers have a realistic plan for the future.

Preadmission status

- Ascertaining the pre-admission status and function of patients is essential for the physiotherapist in order to formulate appropriate, meaningful and realistic problem lists, treatment plans and goals with the patient (where possible).
- Above all else this information is fundamental to safe and successful discharge planning.
- The patient's preadmission functional status can be acquired from a variety of sources, e.g. medical and nursing notes (if separate) may have some information regarding an individual's social history.
- The physiotherapist and OT will require a greater depth of information than that provided by the medical and nursing records. This information must be obtained either directly from the patient, or next of kin/family or carers.
- If the patient has been admitted from a residential or nursing home it is useful to contact the establishment as they can provide valuable information.
- This may be particularly important as some residential/nursing homes may not accept the patient back as a resident unless they have regained their pre-admission status.
- The specific areas of preadmission function that need to be ascertained are:
  - Mobility
    - a. How did they mobilise prior to admission?
    - b. Any aids used?
    - c. Level of independence or assistance required
    - d. Distance mobilised on a regular basis
  - Stairs
    - a. Were they able to negotiate stairs?
    - b. Any aids required?
  - Transfers
    - a. Bed to chair
    - b. Sit to stand
    - c. Level of assistance required
    - d. Level of independence
  - Bed mobility
    - a. Level of independence
    - b. Assistance required.
- Along with the gathering the previous information it is also essential to record if there are any concerns or difficulties with any of the activities and establishing why these difficulties are occurring.
- One of the most important pieces of information to substantiate is whether the patient has experienced any falls and what the circumstances were.

- Wherever possible a ward physiotherapist would be aiming to assist a patient back to their preadmission levels of function, as in some cases independence is solely compromised by an acute illness.
- A number of NHS hospitals have developed acute medical wards and rehabilitation ward/beds where patients who no longer require acute medical care may be transferred. Physiotherapy and MDT colleagues will require a handover including a copy of the professional documentation completed up to this stage of the patient's admission.
- It is important to identify if a patient is having a decline in their functional ability which may become evident during the subjective assessment or from information gathered during previous admissions.
- It is then the role of the MDT to identify why this decline may be taking place. Is it the result of a pre-existing condition or some other factor such as poor levels of support in the community? When planning a patient's discharge these are factors to consider and appropriate and additional support on discharge can make the difference between the patient remaining in their own home and being readmitted within a short timeframe.

Treatment interventions relating to speciality assessments

- In this chapter commonly encountered conditions are covered along with a range of ideas for treatment that may be used.
- Hopefully, whilst working under supervision the student will realise that the most effective plans for intervention are generated from a combination of knowledge of anatomy, physiology, pathologies, the effects of treatment interventions and the assessment findings. Senior clinicians will draw on clinical experience in addition to these factors to ensure that the patient receives the most appropriate management.
- As mentioned previously, there is no specific 'recipe' to follow when treating patients in an acute medicine setting, students and novice physiotherapists will need to develop their theoretical knowledge base and integrate their experiences into the clinical reasoning process that underpins the choice of interventions.
- Patients often present with a complex medical history and the student/novice will be expected to discuss the complexities with their supervisor or senior clinician in order to develop their ability to reassess and progress treatments appropriately.
- It is important to gather feedback from other members of the MDT, e.g. nursing, OT or care support workers. The knowledge of the MDT assessment findings can assist the physiotherapist in planning the patient's treatment programme.
- As an example a patient who is standing well in a standing hoist with other members of the team may progress quicker if the physiotherapist informs the team that the patient is initiating the stand. The MDT discussion may lead to the patient being assessed for their suitability to use a rotastand or Zimmer frame in order to progress the independent function during transfers with other MDT members.

- Sometimes successive treatments will be a combination of assessment and treatment to determine the most effective approach for a patient. This tends to be the case with patients who have conditions such as Parkinson's disease (PD) where it may be necessary to trial what cues work best for them. When treating patients with varying degrees of cognitive impairment it may require the use of a number of different approaches before the optimum method of communication is identified that will ensure the patient engages with their therapy.
- Assessment should have identified a list of problems that are affecting the function of the patient:
  - Reduced muscle strength
  - Reduced balance (static and dynamic)
  - Reduced range of movement (ROM)
  - Poor gait pattern
  - Decreased exercise tolerance
  - Deterioration of functional ability, e.g. sit to stand and bed transfers.
- When considering the treatment of patients in medicine it is important to remember that there is no specific 'medical' approach as such, the management requires a combination of knowledge and skills from the 'core' areas of musculoskeletal, neurology and respiratory practice. To be effective the physiotherapist will need to incorporate all their skills in order to treat their patients effectively.
- Providing walking aids and walking patients does not address the fundamental problems that have brought the patient into hospital. If walking aids are provided include an exercise sheet for the patient to enable them to progress their mobility following your instructions.
- The assessment will have identified specific issues that need specific interventions, e.g. it is more effective to spend 10–15 minutes working on balance and ROM than just walking someone. Set goals and ensure that these are incorporated into the patient's routine to enable them to achieve the best outcomes during their time on the ward.

Communication

- There are three main ways of communicating:
  - Verbal
  - Non-verbal
  - Written.
- It is essential that patients are addressed by the name of their choice and they should be asked this question on initial contact. Do not assume that patients like to be addressed by their forename. It is not appropriate to refer to patients as 'dear', 'babe', 'love', 'duck', ' pet', 'honey', or any similar term. These terms are unprofessional and can be viewed as being derogatory and patronising.
- Remember that the hospital admission of a family member is an anxious time for

relatives. They will often feel out of control of the situation and be keen to acquire as much information and reassurance as possible. It is imperative that communication channels with relatives and carers are established (it is essential to remember that consent is required from the patient before the disclosure of any patient-related information to a third party).

- It is essential to be able to adapt methods of communication with patients.
- Consider the following:
  - The environment the patient is in, e.g. busy medical wards can be distracting for many patients
  - Cognitive impairment either long-standing or acute
  - Patient's ability to hear
  - Visual impairment.
- Some patients may respond better to instructions that are given in short sentences, have pauses between sentences and use positive language, e.g. 'move your bottom nearer the edge of the chair' (pause), 'put your hands on the arms of the chair' (pause), 'slide your feet back' (pause), 'on the count of three stand up' (pause), '1, 2, 3, stand up'.
- Provide further instructions such as 'keep standing' rather than 'don't sit down'.
- Using the word 'don't' – your patient will invariably end with the patient doing what you don't want them to do.
- The ability to adapt your voice when giving instructions will also help to influence the outcome.
- If you are working with another member of staff (PT, PTA or OT) ensure you are both aware of who is leading the session, so the patient doesn't become confused about who they should be following.
- Written communication can be effective for patients with hearing problems and also for those patients who themselves are unable to speak, e.g. cerebrovascular accident (CVA) patients, motor neuron disease, multiple sclerosis (MS).
- Non-verbal communication, such as your body posture and body language, eye contact, can help to develop a rapport with the patient to get them to engage in their treatment.
- This is a useful skill to use with patients who have cognitive impairment, when demonstrating what you want them to do.

Musculoskeletal and orthopaedic problems: treatment options

- The following list highlights the common musculoskeletal presentations/past medical histories frequently seen in a medical environment:
  - Rheumatoid arthritis (RA)
  - Osteoarthritis (OA)
  - Back pain, both specific and non-specific in origin
  - Previous joint replacements, either recent or old

  - Osteoporosis
  - Simple spinal fractures
  - Pubic rami fractures
  - Upper limb fractures, either post fall, mechanical or other causes
  - Muscle atrophy and sarcopenia.
- Commonly, musculoskeletal problems tend to be part of the past medical history (PMH) and they usually contribute to a patient's loss of function when they are admitted, e.g. a patient admitted due to heart failure may have OA in their knees that affects their ability to mobilise.
- Patients may also be admitted for elective or trauma surgery and postoperatively may develop a deep vein thrombosis (DVT) or pulmonary embolus (PE). It is important to be familiar with postoperative precautions, contraindications and complications when attempting to increase a patient's independent mobility.
- It may be part of the role of the physiotherapist to inform nursing staff about any precautions as they may not be familiar with them. What may be obvious to one member of the MDT may not be obvious to other members and therefore the ability to communicate and educate other MDT members is an important skill to develop.
- For a number of patients it is important that they have pain relief prior to any intervention in order to maximise the outcomes from the treatment sessions.
- Time treatment sessions to coincide with medication, in order to maximise therapy and patient outcomes. If pain relief is not adequate, then liaise with the medical teams and/or pain management clinical nurse specialists; this may be beneficial in ensuring the patient has adequate pain relief to get the most benefit from physiotherapy intervention.
- For patients with musculoskeletal problems it is important for them to be given exercise programmes to do whilst they are in hospital and to continue following discharge.
- After their assessment, tailor the programme around their problems, e.g. reduced ROM, decreased muscle strength. Use skills that may have been developed in outpatients and or trauma/orthopaedics in order to treat the patient holistically, e.g. if a patient also has an OA knee provide an exercise programme incorporating strengthening exercises and ROM and provide advice about positioning, ice packs and pain relief.
- It is important to document accurately the exercise programme in the notes in addition to giving patients a copy of the exercise programme or you may wish to photocopy the sheet given to the patient. Also stress the importance of the patient taking responsibility for their own management of the problem as you would in outpatients. For patients who have cognitive decline, you may need to discuss this with the patient's relatives or carers. You may also want to refer to community-based services or to a Day Hospital for further rehabilitation if you feel this is appropriate. Discharge planning is discussed in more detail later in the chapter.

Walking aids

- There are a number of walking aids that can be used to assist with a patient's rehabilitation to promote independence and safety, e.g.:
  - Zimmer frame:
    Improves a patient's ability to weight bear as they provide a wide base of support. However, when mobilising any distance the patient has to lift the frame for every step, which is unhelpful for patients who fatigue or who have difficulty initiating movement, e.g. PD.
  - Wheeled Zimmer frame:
    These avoid the need to lift the frame at each step and provide more fluidity of movement, enabling patients to weight bear with an enhanced base of support. It is wise to consider a patient's home environment and if there are stairs then it will be helpful to issue the patient with two frames, one for upstairs and one for down stairs.
  - Gutter frames:
    Useful for patients where their hands have been affected by RA/OA or if they have sustained a wrist/or hand fracture and are allowed to weight bear through the forearm. These are beneficial for patients that rely on upper limb support and can be a good progression from a standing hoist.
  - Elbow crutches:
    Useful for patients with good co-ordination and where they need upper limb support when weight bearing. These are standard walking aids given to patients post-elective orthopaedic surgery.
  - Gutter crutches:
    Again useful for patients requiring elbow crutches where they are unable to use the hand grips. Ensure that your patient has good co-ordination and good cognitive abilities.
  - Walking sticks and quad sticks:
    Useful aids for patients requiring some additional support when mobilising and can be provided as single items or as a pair. It is important to consider a patient's cognitive abilities and their safety as it is not uncommon to see sticks being carried, rather than being used as walking aids.
  - Fischer sticks and crutches:
    These have moulded handles and are very useful for those patients with disruption of the joints in the hand, e.g. RA.
  - Delta frames and four-wheeled walkers
    Useful for patients with balance issues. Good for outdoor walking. Important to ascertain whether the patient understands the safety precautions and that they are able to operate the brakes safely. In some organisations delta frames are no longer issued due to concerns about the frame folding up unexpectedly. Therefore ensure that the organisation you are working in supports the use of these aids.
- It is always essential to consider different types of gait pattern and weight bearing when

providing mobility aids as well as a patient's ability to follow instructions and their cognitive abilities.
- Zimmer frames can also be adapted by OTs with a Buckingham caddy to assist patients with transporting meals and drinks and to carry belongings.

Muscle atrophy and sarcopenia

- Muscle atrophy is a decrease in the mass of a muscle which can be partial or complete. Atrophy results in weakness as the overall muscle is unable to exert the force in relation to its mass. Conditions which can result in atrophy include cancer, congestive heart failure, COPD, renal failure and burns, liver disease and starvation, which are all conditions commonly seen in patients on the medical wards.
- Atrophy results in a decrease in the quality of life for the individual as performing tasks such as standing and walking become more difficult and become associated with an increased risk of falls. Causes of atrophy include exercise, hormones, nutrition, denervation and motor neurone death.
- Sarcopenia is the loss of muscle tissue that occurs over a lifetime and is also commonly used to describe its clinical manifestations (Lang et al 2010). Age-related loss of muscle mass results from loss of slow and fast motor units with an accelerated loss of fast motor units (Lang et al 2010). Clinical manifestations of sarcopenia include loss of mobility and independence and increased risk of injury secondary to denervation, changes in hormonal and inflammatory environment, mitochondrial dysfunction combining to produce losses in the bulk properties of muscle tissue such as muscle mass and strength (Lang et al 2010). Maintenance of muscle mass and strength is critical for preservation of physical activity in older age and important in decreasing the risk of falls and skeletal fractures (Lang et al 2010).

Neurological problems: treatment options

- Common presentations encountered on medical wards include:
  - Parkinson's Disease (PD)
  - Multiple Sclerosis (MS)
  - Cerebro Vascular Accident (CVA)
- Neurology is a 'core' topic area that is not intended to be covered in any depth by this book. The reader is advised to consult a core neurology textbook (e.g. Edwards 2002). However, ideas and treatment suggestions are provided for the three conditions commonly seen on medical wards.

Parkinson's Disease (PD)

- Patients commonly present with problems associated with the initiation of tasks, e.g. sit

to stand, gait, bed mobility; especially rolling.

- They may also present with a simian posture, i.e. a stiff thoracic spine, decreased ROM in shoulders.
- The physiotherapist should be thinking about function at home, e.g. reaching into cupboards, washing and dressing.
- Always check medication prescribed and discuss with the patient if they find it effective. In more severe cases treatment may be more effective if timed to coincide with the effects of medication.
- It may be necessary to liaise with the medical team about medications as the patient may benefit from a medication review.
- These patients respond well to different types of cuing:
  - Visual cuing, involving the use of markers on the floor for patients to step towards
  - Verbal cuing, where the physiotherapist counts or repeats right, left
  - Cuing is often more effective if the patient can cue themselves (Morris 2000)
  - Proprioceptive cuing where the patient rocks during a sit to stand movement.
  - Alternatively it is possible to use a combination of the above, e.g. counting as well as rocking during the move from sitting to standing.
- Patients may need work on their functional abilities, e.g. rolling, lie to sit, sit to stand and this needs to be incorporated during treatment sessions.
- Consider what sort of walking aid the patient has and any need to change it. High-level patients find delta or four-wheeled walkers beneficial, as they enable more fluid movement. For patients whose balance is not adequate for these aids a wheeled Zimmer frame (WZF) can be beneficial as these also provide some fluidity for movement with additional balance support. Standard Zimmer frames (ZFs) are unhelpful as the patient has to lift them for each step and if there is a problem initiating movement, then this is compounded.
- The paper by Morris (2000) is an excellent text in providing a problem-solving approach and advice to problems commonly seen in PD along with advice on what should be worked in the different stages as per the Hohn and Yahr scale (Goetz et al 2004).
- A useful outcome measure for treatment of PD is the Lindop Parkinson's Scale (Pearson et al 2009).

Multiple Sclerosis (MS)

- Patients who are admitted to a medical ward are generally admitted for reasons other than their MS.
- Generally if they have a true relapse, in their MS, they will be admitted to the regional neurological unit for their initial treatment.
- Presenting complaints such as a urinary tract infection, respiratory tract infection or pneumonia can result in their symptoms worsening. This is due to the increase in body temperature which tends to impair their neural transmission.
- As any infection subsides with treatment then the patient's impairments, activities and

function will improve.

- This is not to say that the patient will not require physiotherapy. For many patients the infection will subside relatively quickly, however the physical recovery will take longer to recover.
- Points to consider include:
  - What sort of MS do they have, e.g. relapsing/remitting, primary progressive or secondary progressive?
  - When they have had relapses, how have they tended to progress in their rehabilitation and recovery?
  - Level of function prior to admission.
  - Any community-based physiotherapy services they may have been accessing. (If so, it is important to liaise with these teams to find out whether there are any problems in particular that need to be considered or addressed.)
  - How mobile were they and were any walking aids used?
- This information should be combined with objective neurological assessment findings to formulate a treatment plan.
- The treatment plan will need to consider the following:
  - Bed mobility; any physical assistance required?
  - Bed to chair/commode transfers. Is any equipment required, e.g. a full sling hoist, standing hoist, rotastand or walking aid?
  - Seating, do they have sitting balance? If not it will be necessary to liaise with the occupational therapists to obtain suitable seating and pressure-relief care.
  - Mobilising requiring any assistance? If so how much? Walking aid required?
  - Strengthening exercises, balance exercises.
  - Any tonal problems that need addressing? If so splinting or equipment such as a T-roll may be needed.
  - You may need to consider positioning charts for patients with progressive MS if they have had long-term problems prior to admission.

CVA

- There are now standardised national guidelines regarding rehabilitation with stroke patients (NICE 2008). There is also a 2-yearly national Sentinel audit which all trusts with acute stroke units take part in (Royal College of Physicians 2008). Further details can be found on the CSP website (www.csp.org.uk).
- Recommendations for the implementation of stroke management are outlined in the NICE standards document as follows ‘Patients with stroke are assessed and managed by stroke nursing staff and at least one member of the specialist rehabilitation team within 24 hours of admission to hospital, and by all relevant members of the specialist rehabilitation team within 72 hours, with documented multidisciplinary goals agreed within 5 days’ (NICE 2008).
- The standards also state that patients with stroke are ‘offered a minimum of 45 minutes

of each active therapy that is required, for a minimum of 5 days a week, at a level that enables them to meet their rehabilitation goals for as long as they are continuing to benefit from therapy and are able to tolerate it' (NICE 2008).

- It may be helpful to undertake the initial assessment with the occupational therapists as they will be able to assess the patient for seating needs.
- Depending on the assessment findings and the resulting problem list it may be necessary to address the following:
  - Altered tone, consider neural and non-neural components
  - Upper limb:
    Shoulder: beware of low tone shoulder which will be vulnerable to subluxation as a result of the loss of supportive muscle tone around the joint. Preventative measures need to be implemented, e.g. an arm rest on the wheelchair when sitting out. Support the upper limb with pillows when in bed
  - Owing to the patterning that can occur in the upper limb in the high tone patient, movements to maintain range must be combined with methods of reducing tone
  - Elbow: stretching/mobilising/massage can help to reduce flexor hypertonus in the elbow
  - Splinting to maintain range can also be helpful, be aware of pressure areas
  - Wrist and fingers: passive movements, positioning and liaising with the occupational therapists regarding splinting to maintain the hand's resting position and enable skin care to be carried out by the nursing staff.
- Low tone is generally easier to manage in the lower limbs than high tone (Edwards 2002).
- For patients with high tone the use of T-rolls or wedges is useful in maintaining alignment and preventing contractures and this is used in conjunction with seating.
- The seating needs should be determined in the early stages of rehabilitation with the main aim being to establish the method of transfers that can be reinforced by all members of the MDT on a daily basis.
- Lower limbs
  - Hips and knees: if there is high tone a T-roll can help break patterning
  - Casting may need to be considered for the ankle in order to maintain ROM
  - Massage and mobilisation of the foot and ankle muscles and joints will help to maintain the ROM that will be needed when a patient undergoes gait re-education
  - Positioning is particularly beneficial particularly for patients with severe hypertonus to prevent the asymmetry that can lead to the development of contractures.

Positioning in bed

- Depending on the firmness of the bed, side-lying can be useful to increase the extensibility of the trunk by providing a stretch to the supported side. Alternatively a pillow placed under the lower side will provide a stretch to the upper side.
- Side lying may also be a useful position to treat the upper limb if a patient lacks

independent sitting balance.

- Supine lying can be useful to provide a secure base of support for patients with high or low tone to ensure that the optimal alignment of muscles and joints is possible.
- Half-lying can be achieved by elevating the head of the bed, rather than using extra pillows to align the head/neck/trunk. The physiotherapist needs to be aware of the risk of contractures, by placing the hips in flexion.
- Prone lying can be useful for maintaining or correcting range into extension at the hips and knees.
- It is important to consider any associated medical issues, e.g. respiratory compromise that the patient may have when lying flat and take these into account when planning treatment.
- The use of a T-roll or pillows can help to break up hypertonic patterning in the lower limbs and provide more symmetrical alignment.

Sitting balance

- In the early stages of rehabilitation taking the patient to a therapy gym is important for regaining sitting balance and is easier to achieve than attempting this on an air-pressure mattress.
- Attempting to rehabilitate sitting with a patient on an air-pressure mattress on the ward is more difficult and more tiring than using a treatment plinth in the gym.
- Ensure the patient is supported appropriately, this includes the feet being part of the base of support.
- Consider the amount of upper limb support when working on static sitting balance.
- For dynamic sitting balance and reaching outside of the base of support, make the treatment purposeful and goal-orientated, e.g. reaching for a bottle of water.
- Ensure that there is support for the patient if they cannot maintain their balance, e.g. someone sitting at their side to stop them falling or mats/pillows positioned to cushion their fall.

Transfers

- There are a range of methods to transfer a patient, dependent on their ability:
  - Full sling hoist for patients in the early stages of rehabilitation who do not have sitting balance or sufficient lower limb strength for weight bearing
  - Standing hoist can be useful to encourage weight bearing and this method of transfer is often used by the nursing staff when transferring patients from bed to a chair or commode
  - Rotastands can be used with patients who have the ability to stand but are unable to step safely or effectively. Consider the ability of the upper limb to be able to grip the rotastand
  - Sliding board transfers can be used to transfer patients from bed to a chair or

commode, if they have sitting balance, but are unable to stand effectively. Consider level of function in the affected side and any inattention problems
  – Stand and step transfers can be used for patients with the ability to stand safely. Consider the use of a walking aid if necessary and the number of staff required to reduce the risk associated with the patient falling.

Seating

- Seating needs to be supportive, maintain alignment of muscles and joints and key segments, e.g. position of hips, pelvis and trunk. Seating can be useful for assisting patients to become orientated to midline balance.
- It is also an effective method in reducing respiratory complications, particularly in those at risk, e.g. patients with dysphagia.
- Effective MDT communication is required to ensure correct positioning, awareness of skin integrity and the patient's sitting tolerance.
- Tilt in Space wheelchairs, e.g. a Cirrus chair, may need to be used for patients requiring maximal support for maintaining sitting balance, with additional support being required on the affected side.
- Standard wheelchairs can be provided for patients who have good sitting balance (may require minimal support).
- Lateral supports can be placed in the chair to support the low tone trunk and achieve good postural alignment.
- Upper limb supports can be provided if there are concerns around the positioning of the hemiplegic upper limb.
- Wheelchair trays can assist the awareness of midline and support of the trunk and upper limb.

Standing balance

- Being able to stand (with or without assistance) or be placed into a standing position is beneficial in maintaining joint ROM in the lower limbs and stimulating antigravity muscles. For patients with hypertonus who require total support to stand, a tilt table can be used in the early stages of treatment.
- Treatment can also be performed in the parallel bars with a mirror being used for those patients struggling to regain midline balance or who have sensory deficits.
- Standing can be undertaken at a high/low table with knee block, which can enable upper limb function to be treated at the same time. Planning is required to ensure the appropriate number of staff are available to facilitate this safely.
- Static and dynamic standing balance can also be treated with the patient in the upright posture.

Gait

- Consider cognitive and inattention problems, use of walking aids if necessary and the level of support required in the early stages of gait re-education.

Respiratory problems: treatment options

- Common respiratory conditions seen in medicine include:
  - Chronic obstructive pulmonary disease (COPD) exacerbations (infective and non-infective)
  - Pneumonia
  - Lower respiratory tract infection (LRTI).
- It is not uncommon to encounter these patients if called into hospital during an on-call situation, especially if they are experiencing high fraction of inspired oxygen (FiO_2), decreased oxygen saturation (SaO_2), increased work of breathing (WOB) and poor airway clearance.
- It is also important to ascertain if the problem is appropriate for physiotherapy, e.g. a consolidated pneumonia is not, treatment consists of oxygen therapy and positioning to optimise ventilation/perfusion (V/Q).
- One of the most challenging decision for a physiotherapist to make, in an on-call situation, is when to decide not to carry out treatment interventions.
- The decision is based on assessment and subsequent clinical reasoning and this is essential when justifying whether to intervene or not.
- In treating the respiratory patient, in particular the acutely ill, it is helpful to establish the problems by using a multisystem approach (refer to Chapter 9 in Volume 1). By doing this you can then establish the main respiratory problems which may involve any of the following:
  - Decreased lung volumes
  - Increased work of breathing
  - Ineffective airway clearance.
- Poor gas exchange and increasing FiO_2 requirements are usually as a result of one or a combination of the above.
- For decreased lung volumes the following treatment intervention can be effective:
  - Deep breathing exercises
  - Positioning
  - Mobilising
  - Intermittent positive pressure breathing (IPPB)
  - Cough assist.
- For increased work of breathing:
  - Positioning
  - Relaxation and breathing re-education
  - Pacing
  - IPPB.

- For ineffective airway clearance:
  - Positioning
  - Mobilising
  - Manual techniques
  - Humidification and hydration
  - IPPB
  - Cough assist
  - Suction, either oropharyngeal (OP) or nasopharyngeal (NP).
- When treating a respiratory patient it is advisable to start with 'simple' treatments and then progress.
- For more complex patients seek support and always be aware of your own competence.
- Mobilising a patient is one of the simplest and most effective ways to increase lung volumes and assist the clearance of secretions.
- Consider if the patient requires supplementary oxygen if the plan is to mobilise them over any great distance.
- *Positioning* is a useful adjunct to treatment.
  - Upright sitting is the best position to increase lung volumes and improve V/Q mismatch, therefore wherever possible sit your patient out of bed (Hough 2001)
  - It is not always possible as a patient may be too unwell to sit out
  - Alternative positions such as side lying work well and may be a better option than high sitting, as this can rapidly turn into slumped sitting which will compromise airway expansion
  - Combine positioning with other treatments such as IPPB, manual techniques and airway clearance exercises. Manual techniques are particularly useful when a patient is unable to follow commands
  - It is important to educate and advise nursing staff about the most effective positioning for a patient and how often this should be implemented.
- *Airway clearance exercises*: either Active Cycle of Breathing Techniques (ACBT) or autogenic drainage (AD). Patients need to be alert enough to follow undertake this.
  - If they struggle to grasp FET, simplifying the exercise to deep breaths with inspiratory hold and cough can work well
  - Treating a patient in side lying may be effective if they have, for example, a lower lobe infection.
- *IPPB and cough assist* are similar, both provide positive pressure and therefore increase lung volumes, reduce work of breathing and aid secretion clearance. Cough assist can provide negative pressure, thereby stimulating a cough.
  - The cough assist is particularly good for those patients who have a very weak cough. For patients that are drowsy a face mask can be used for both adjuncts
  - Some patients do not tolerate the treatment as they can find the sensation of positive pressure uncomfortable. Reconsider the treatment choice and opt for positioning, airway clearance exercises and manual techniques.
- *Suctioning* can be daunting for students and less experienced physiotherapists. It is an

effective treatment for those patients where treatment options are limited because the patient is too drowsy to comply with instructions and can be used in conjunction with positioning.

- For patients needing repeated nasopharyngeal (NP) suction a NP airway should be inserted, as repeated blind suctioning can cause trauma to the nasal passages, resulting in swelling that can make it more difficult to insert a catheter
- To choose the appropriate size, in clinical practice this has been estimated on the basis of the distance from the nostril to the earlobe or the diameter of a patient's little finger. However, studies have shown these to be less accurate than an estimation based on an individual's height (Table 9.1)
- The most important factor is that the airway is the correct length in order to ensure that it separates the soft palate from the pharynx and not too long so that it aggravates the cough or gag reflex
- Ensure that there is adequate gel on the airway during insertion and once inserted, place a sterile safety pin on the end to prevent the airway from becoming drawn down the nasal passage
- To decide what size catheter to use in conjunction with an airway calculate the following. Multiply the NP airway size by 3 and divide this by 2. If you get an answer such as 10.5, use a size 10 catheter
- Ensure the catheter is lubricated prior to insertion; difficulty passing the catheter can be helped by pulling the airway out a little
- If you are not confident or competent to do this procedure speak to a more experienced physiotherapist or alternatively a member of nursing staff or an anaesthetist who is competent to insert the airway
- The advantage of NP airways is that once in situ the nursing staff can suction as well, thereby reducing the need for frequent physiotherapy, especially at night
- Nursing staff may need to be shown how to do this
- For agitated patients airways are not appropriate, they may pull them out if they find them uncomfortable
- For OP suction a Guedel airway should be used when the patient is unlikely to have a gag reflex present, e.g. unconscious patient
- If a patient has a gag reflex they may vomit and obstruct their airways
- If the airway is too large the glottis may be closed occluding the airways
- These can be sized by aligning the flange with the centre of the patient's lips and the tip to the angle of the mandible.

Table 9.1 Guide to the choice of size of nasopharyngeal cannula (based on Roberts et al 2005)

Subject height	NP cannula (PortexTM) size
Short female (less than 163 cm)	6 with pin 1 cm from flange
Average female (163 cm), short male (less than 178 cm)	6

Tall female (163 cm+), average male (178 cm)	7
Tall male (178 cm+)	8

Oxygen therapy

- This is prescribed by a doctor and should be written in the drug chart along with the appropriate target saturation.
- It is important to know the appropriate saturation for different conditions, e.g. in chronic conditions, lower oxygen saturations are required.
- The aims of oxygen therapy are to:
  - Correct hypoxaemia
  - Decrease the symptoms associated with chronic hypoxaemia
  - Decrease the workload hypoxaemia imposes on the cardiopulmonary system.
- The absolute indication for O_2 therapy is inadequate tissue oxygenation:
  - $PaO_2 < 8$ kPa or $SaO_2 < 90\%$
  - Acute care situations which increase O_2 requirements or risk of hypoxia, e.g. cardiac arrest, shock (BTS 2008).
- Beware of:
  - Hypoventilation in CO_2 retainers
  - Oxygen toxicity
  - Drying of mucosal membranes
  - Discomfort.
- Oxygen can be delivered by:
  - Low-flow/variable-performance devices
  - Simple facemask, inaccurate indication of oxygen being delivered to the patient
  - High-flow/fixed-performance devices
  - Venturi system which provides an accurate FiO_2
  - High-concentration reservoir mask
  - Nasal cannula
  - Used for long-term therapy patients who require low amounts of oxygen (1–4 l/min)
  - Humidification
  - Important for those patients where high flow rates are required for more than 24 hours
  - Patients have excessive thick secretions
  - NB For all trachea patients – O_2 should be warmed
  - Warmed humidification is far more effective than cold as cold humidified O_2 can aggravate bronchospasm (Williams et al 1996).
- Long-term O_2 therapy (LTOT) is sometimes necessary for patients that have severe hypoxaemia. It has the benefits of:
  - Reducing cor pulmonale
  - Increased quality of life

- Increased sleep
- Reduced exacerbations and hospital admissions (Hough 2001).

- Patients requiring LTOT will normally be reviewed and assessed by respiratory nurse specialists approximately 1 month after they have been discharged once blood gases have stabilised.
- Patients must have stopped smoking before being considered for oxygen.
- Patients must also be educated as to why they have it.
- Aim to achieve PaO_2 of at least 8.7 kPa without a rise in PCO_2 of greater than 1.3 kPa (www.patient.co.uk).

Pulmonary rehabilitation (PR)

- Pulmonary rehabilitation is a multidisciplinary programme of care for patients with chronic respiratory impairment that is tailored and designed to optimise each patient's physical and social performance and autonomy (General Practice Airways Group 2008).
- Patients with COPD who suffer with breathlessness are inclined to avoid exercise, subsequently becoming unfit and demotivated.
- This patient group can become depressed, anxious and socially isolated.
- Pulmonary rehabilitation can assist in addressing all these issues. It is also effective in improving quality of life, exercise capacity and dyspnoea (GIAG 2008).

On an acute medical rotation you will probably not be involved in delivering PR as increasingly it is being delivered in the community. However, it is important that you are familiar with the concept and are aware of its role in the multidimensional management of COPD, and where appropriate, when to refer on to this service.

Alternative reasons for admission to an acute medical ward

- There are numerous different reasons and conditions as to why a patient may be admitted which do not fall under the previous categories.
- Conditions include:
  - Cardiac conditions, e.g. cardiac failure, arrhythmias, problems with pacemaker, ischaemic heart disease (IHD)
  - Renal failure either acute or chronic
  - Dehydration
  - Urinary tract infection
  - Diarrhoea and vomiting
  - Falls
  - Not coping at home (NB the word acopia is no longer used)

- Confusional states either due to a long-term condition, e.g. dementia or Alzheimer's disease, or acute conditions such as infection or altered blood chemistry
- Psychological reasons, e.g. overdose
- Uncontrolled diabetes
- Oncology.

Cardiac conditions

- These are frequently reasons for admission to an acute medical ward.
- Symptoms commonly include shortness of breath (SOB), decreased exercise tolerance, shortness of breath on exertion (SOBOE), fatigue/lethargy, syncope, chest pain. Patients with cardiac failure may also have oedema, which in extreme cases can be visible from an individual's waist downwards.
- Treatment will consist of coping strategies when experiencing SOB, pacing techniques and building exercise tolerance.
- It is important when treating these patients to give consideration that many cardiac conditions will progressively worsen, so treatments and goals need to be realistic.
- Patients that have experienced chest pain may need a stair assessment.
- This can be useful to teach pacing techniques as patients find it reassuring if they have experienced chest pain in the past how they can exert themselves.

Renal failure, dehydration, diarrhoea and vomiting

- These are other common reasons for admission to hospital.
- Symptoms can include: decreased urine production, oedema, problems concentrating, confusion, fatigue, lethargy, abdominal pain.
- These symptoms can be as a result of altered blood chemistry, e.g. electrolyte imbalance and increased renal function markers.
- Medical treatment will concentrate on rebalancing these and as levels return to normal the symptoms and function will improve.
- However, patients will commonly have difficulties transferring, mobilising and will have general weakness.
- Physiotherapy intervention can include strengthening exercises, balance retraining, mobility practice and gait re-education, but assessment findings will be the most important indicator of what specifically needs to be included in treatment.

Falls

- Falls rehabilitation is also covered in chapters 2, 6 and 7 in this volume.

- In the acute setting, it is important to establish if the cause is mechanical or if it is due to another cause such as postural hypotension, as some causes for falls are not amenable to physiotherapy.
- It is well documented that specific exercise or rehabilitation programmes working around the patient's individual problems are more effective than group work.
- However, as part of your discharge planning you may decide that it is appropriate to refer the patient to a balance and safety group, where their problems can be explored and overcome in more detail.
- Consider the following factors when dealing with falls; age-related changes in sensorimotor function, vision, peripheral sensation and neuropathies, vestibular sense, muscle strength, reaction time as well as other medical risk factors including polypharmacy, residual stroke, PD, postural hypotension, syncope, arthritis, foot problems, psychological and cognitive factors (Darowski 2008).
- For higher-level patients a validated exercise programme such as the Otago scheme can be effective (Thomas et al 2010).

Dementia and Alzheimer's disease

- Consideration needs to be given to the stage of the disease process as patients in the earlier stages will be able to undertake exercise programmes with guidance. Patients are not admitted just because they have dementia, but because of another reason such as a fall or an infection, e.g. urinary tract.
- The medical wards are busy and highly stimulating environments, which for patients who have advanced disease can be confusing and ultimately distressing.
- The medical team will want to treat the underlying cause for admission and then discharge the patient home as quickly as possible to minimalise the disruption to their routines.
- Communication is very important, with very confused patients.
- These patients are unable to process protracted pieces of information, so giving short instructions is preferable.
- Make treatments purposeful, containing activities that the patient is familiar with such as sit to stand and mobilising.
- Give them realistic goals to work towards, e.g. 'let's walk towards the nurses' desk.'
- For patients who are fearful of falling, treatments used for falls patients can be used with great effect.
- With patients who have cognitive impairment or psychological problems it can be difficult to ascertain if they are progressing.
- It is essential to establish a rapport with these patients.
- This may take some time to build, however, by seeing the patient regularly and keeping treatments simple and purposeful, patients will be able to benefit from physiotherapy intervention.
- For those patients who have been admitted due to an infection, the level of confusion will

reduce.

- It is necessary to find out pre admission levels of impairment from family members or carers.

Oncology management

- The reader is referred to chapter 12 for more information about oncology management.
- Patients can be admitted to the ward as a result of suspicious symptoms that require further investigation and are therefore provisionally diagnosed with cancer or they have been previously diagnosed with it.
- Diagnosis may be of a primary or secondary cancer and symptoms can be varied requiring the physiotherapist to draw on a wide range of clinical skills.
- Discharge planning can be complex, especially for those patients who have a poor prognosis, as there have been changes to funding for continuing care.
- Effective and sensitive communication is required along with effective MDT working.
- Discussion of plans with the patient and family should include other professions such as the palliative care nursing services in the patient's home locality.

Establishing rehabilitation potential

- There are many factors contributing to successful rehabilitation outcomes and in many cases this can be based around the personal preferences of the therapists involved in a patient's management.
- The inter-relating factors that are acknowledged in the literature include compliance, motivation and efficacy (Haynes et al 1979, Maclean and Pound 2000, Maclean et al 2002, Resnick 1996, 2002).
- Haynes et al (1979) defined compliance as 'the extent to which the patient's behaviour (with regards taking medications or lifestyle changes) coincides with medical or health advice'.
- Within rehabilitation motivation is viewed as an important component, but remains vulnerable to subjective judgement and a challenge to objectively measure (Siegert and Taylor 2004).
- Maclean and Pound (2000) propose that the literature relating to the concept of patient motivation within physical rehabilitation falls into three broad approaches:
  - Motivation is an internal personality trait of an individual
  - Motivation is a product of social factors
  - Motivation is influenced by a combination of personality and social factors.
- Brillhart and Johnson (1997) identified five domains associated with motivation and coping ability:
  - Independence
  - Education

    - Socialisation
    - Self-esteem
    - Realisation.
- If a patient demonstrates deterioration in their communication, function and continence, it is proposed that they may be experiencing deprivation, anxiety and/or decreased confidence in all 5 domains; all of which may be compromising the individual's motivation to engage.
- Maclean et al (2002) highlighted that health professionals' behaviour can enhance or diminish patient motivation. If a patient is labelled non-compliant, difficult or uncooperative by a MDT, communication channels may break down.
- Labelling over time can lead to a self-fulfilling prophecy where a client's behaviour is anticipated by staff. This expectation alters staffs' verbal and non-verbal interactions with the client and can result in the anticipated behaviour being demonstrated.

Prioritisation of caseload

As discussed in Volume 1, Chapter 9 frequent prioritisation of a clinical caseload is essential. There are many different tools that may be used in the workplace, an example of this can be seen in Appendix 9.1.

- As a guide, patients who are a priority for any particular day are those:
    - Where discharge will be delayed if not seen
    - Where respiratory status will deteriorate if not seen
    - New patient referrals that link into the above categories
    - New patients referred into the service – requiring assessment in order to prioritise their therapy needs.
- If experiencing difficulties with prioritisation communicate this to your supervisor or a more senior member of the physiotherapy team without delay.
- Use all available staff resources, for example physiotherapy assistants and optimise team working with joint therapy sessions with occupational therapists and nursing staff.

Aims of treatment and goal setting

- The aims of physiotherapy interventions in the acute setting are to maintain and restore functional decline. Goals may depend on individual characteristics such as age, psycho-social factors, health conditions and environmental factors (Mittrach et al 2008).
- Physiotherapy goals should be specific, measurable, achievable, realistic and timed (SMART).
- Physiotherapy interventions are amalgamated into an ongoing and cyclic process. This process involves the identification of an individual's problems and needs, the relationship between the problems and the relevant factors of the person, definition of

goals, the planning of interventions and finally the assessment of the effects (Stucki et al 1997, cited in Mittrach et al 2008).

- Goal setting and re-evaluation allows the measurement of the result of any intervention (Mittrach et al 2008), with therapists needing to get to know their clients as a person before it is possible to assist them in setting meaningful goals (Siegart and Taylor 2004).
- Motivation and the formulation of goals are inextricably linked (Siegart and Taylor 2004).
- When a client participates in goal-formulation, planning and decision making, the potential for active participation in the rehabilitation process has been shown to increase (Pollock 1993, cited in Wressle et al 2002).

Discharge planning

- The practice of initiating discharge planning when a patient is first admitted can be a challenging concept to grasp, but there can be generalised pressures to move patients through the hospital system as efficiently and safely as possible therefore this must be considered.
- There may be occasions that physiotherapists are under pressure to agree that a patient can be discharged when physiotherapy assessment or intervention has not been completed. If following the assessment of risk you are not happy that a patient is being discharged do not feel under pressure to say otherwise. Similarly, if a patient is discharged against physiotherapy advice or prior to a physiotherapy assessment ensure this is documented in physiotherapy documentation.
- If a patient's mobility is a specific concern it may be appropriate for physiotherapists to attend a home visit with the occupational therapists and the patient concerned. These visits can provide insight into how an individual functions within their home environment.
- The assessment of the element of risk on discharge can be a difficult dilemma for any physiotherapist. If a patient can mobilise safely and independently on the ward with a rollator frame, but you are aware that their flat is too small to accommodate a frame and would actually be a falls risk if used at home what would you do? This is the type of dilemma you could be faced with.

Onward referral

- Intermediate care teams were formed on the back of the National Service Framework for Older People in 2001.
- The purpose of intermediate care is to prevent unnecessary hospital admissions, but also to expedite discharge from secondary care by providing support to the patient on discharge.

- Intermediate care services tend to be organised geographically with strict boundaries, therefore refer to local arrangements regarding the name of local services and referral criteria. Some services require multidisciplinary involvement to accept a referral.
- Alternatively community physiotherapy services are normally available in most geographical areas to accept physiotherapy referrals, however the demand for these services is high and the service often limited as a result.
- Referral to specialist teams such as respiratory outreach teams (for COPD, asthma). Multiple sclerosis and PD specialist nurses need to be contacted as appropriate. If there is a specific physiotherapy issue, e.g. mobility, function, chest management, it may be beneficial to discuss and advise this with the team in person, on the telephone or through a written discharge report.
- In the absence of discharge co-ordinator nursing staff generally tend to take responsibility for co-ordinating the re-starting of care packages. However, physiotherapists may need to be involved in helping to identify discharge timescales or justification for increases in packages of care or types of community care.

Documentation/CSP standards

- The importance of maintaining a high standard of professional documentation cannot be stressed enough. Fundamentally your professional documentation is crucial for your protection in the event that you are faced with an informal or formal complaint. Members have a legal responsibility to keep an adequate record of their patient interventions to demonstrate to a third party what they did, why they did it and when they did it. The CSP standards describe the components of the written record that will satisfy this legal requirement (CSP 2005).
- The Ombudsman Office received nearly 9000 properly made complaints about the NHS in the last year, 18 per cent were about the care of older people (Parliamentary and Health Service Ombudsman 2011). The total number of complaints made to Hospital/PCT Chief Executives across the NHS is significantly higher.
- Remember: if it isn't written down in the professional documentation – it never happened. If patient-related and/or physiotherapy information is handed over to another MDT colleague it is necessary to document this 'handover' of information and to whom it was handed over in the PT documentation. If MDT notes are in operation this may not be necessary.
- It is advisable to complete patient documentation after the treatment intervention is completed. This is to ensure that the documentation is accurate and reflective of intervention. If 15 plus sets of notes are left to the end of the day, all with perhaps similar types of intervention, important detail may be lost.
- It is recommended to write any information (that is being verbally handed over) into the relevant MDT colleagues' documentation, e.g. medical notes.
- If advice is given to the patient it is necessary to document what was advised.

- Along with adhering to documentation standards it is appropriate that as a professional you have awareness of, and abide by, the CSP professional code of conduct.

Conclusion

The conditions, medical presentations and their combinations that will be seen during a rotation within acute medical rotation are endless. The impact that physiotherapy intervention can have on this client group is significant and overwhelmingly professionally rewarding.

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Chapter 9

E-materials

Author profiles

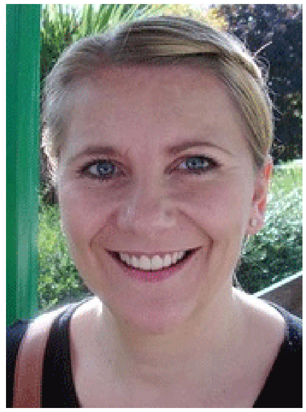
Beverley Greensitt BSc(Hons) MCSP

Bev qualified from King's College London in 2004 and following this she has completed a broad range of rotations as a band 5. She has been working as a senior clinician in Acute General Medicine. Whilst working in medicine Bev has developed a portfolio of experience working on Gerontology wards, day hospitals, providing MDT management and rehabilitation to elderly patients. Bev has particular interests in providing clinical education for students and educating about and promoting the role of physiotherapy and rehabilitation in an MDT setting. Bev has found that contributing to the medicine chapters and material has provided an opportunity to clarify the types of experiences encountered and the skills necessary for working in a medicine environment.

Clare Nickols MSc BSc(Hons) MCSP

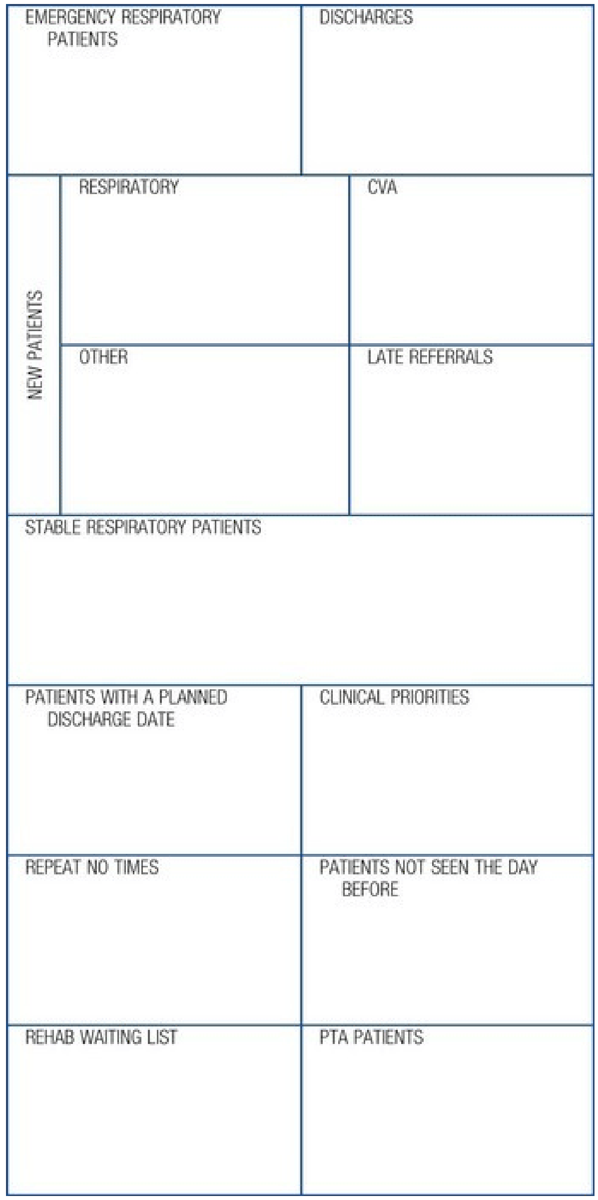
Clare Nickols qualified from The University of East London in 1996 and completed her junior rotations at The Homerton Hospital in Hackney. Clare then worked at The Royal Hospital for Neuro-disability in Putney for 3 years. She specialised in the rehabilitation of people who have acquired complex brain injuries and challenging behaviour. Clare is currently the In-

patient Services Team Leader and Deputy Physiotherapy Manager at Heatherwood Hospital in Ascot. She achieved a distinction in the Masters in Rehabilitation at Oxford Brookes University in 2007.



Appendix 9.1

Daily prioritisation sheet



Guidelines for prioritisation sheet

For any patient you go and see, remember to write your name against the patient's name.

Emergency respiratory

- Patients who are very sick and require immediate respiratory physiotherapy. For example, those patients you would see in an on-call situation.

Discharges

- Patients who require assessment for discharge.
- Patients who you are seeing who have reached their premorbid level of function and can therefore be discharged from your list.

New patients

- Respiratory – must be seen on the day of referral.
- CVA – must be seen with 72 hours from the onset of their stroke.
- Other – e.g. mobility referrals. Must be seen within 48 hours of referral.

Late referrals

- These are mobility referrals that are given during the day, i.e. not at handover.

Stable respiratory

- Patients who do not require intensive respiratory physiotherapy, e.g. those patients on 2–3 l O_2.

Patients with planned discharge date

- Patients where the plan is to get them straight home, i.e. not for rehab. With these individuals they should be seen daily so they get more input and then you may decide to hand them over to a PTA to maintain their mobility whilst they are awaiting discharge, e.g. for care package.

Clinical priorities

- For example, patients who may need a week of daily input to determine their discharge destination.

Patients that were not seen the day before

- Any patient who did not receive treatment the day before.

Patients on a list for further rehabilitation

- Patients who are on a waiting list for further rehabilitation (CH/ICB). You may decide to alternate these patients between this category and the no times box if you are particularly busy.

PTA patients

- Patients for maintenance work, progression of mobility, passive stretches. These patients MUST be given sit to stand programme and strengthening or balance exercises (this is more important than mobility practice).
- For patients who are doubles, PTAs can go through bed or chair exercises with the patients.

Physiotherapy assistant priorition sheet

PHYSIOTHERAPY DOUBLES	NEW PATIENTS
DISCHARGES	PATIENTS WITH PLANNED DISCHARGE DATE
PATIENTS NOT SEEN THE DAY BEFORE	PATIENTS ON A REHAB WAITING LIST

Guidelines for physiotherapy assistant prioritisation sheet

Physiotherapy doubles

- Patients requiring two or more people to treat them.

New patients

- New patients handed over from the physiotherapist.

Discharges

- Patients for discharge that day.
- Patients who have reached their required level of function and can be discharged from the caseload.

Patients with a planned discharge date

- Patients who require intensive input and therefore must be seen daily in order for them to return home.

Patients not seen the day before

- Any patient who did not receive treatment the day before.

Patients on a rehab waiting list

- Patients awaiting rehab at either a community hospital or ICB. These patients must have been given a sit to stand programme and strengthening or balance exercises. This MUST be carried out prior to any mobility practice.

Case Study 9.1

Background

- 54-year-old woman.
- Previously fit and well.
- Lived alone.
- Independent with all ADLs.

PMH

- Hypertension.

HPC

- Transferred to an acute general medicine ward from the neurosurgical unit after having a Grade V subarachnoid haemorrhage 2 months previously.

- The patient had been assessed and treated by a rotational band 5 on the ward.
- During this time the patient developed diarrhoea and was unable to sit out in the cirrus chair provided by the OT.
- A stretching programme was devised for the PTA to carry out during the period of bed rest and this was continued for 7 weeks.
- Once the patient's diarrhoea had stopped, they were able to start sitting out again.
- A joint assessment was carried out with the OT to ensure that the seating remained appropriate in view of her not having been out of bed for 7 weeks.
- The medical team requested that the patient have intensive physiotherapy.
- The band 5 explained to the house officer that due to the size of her case load she had delegated treatment to the PTA who was carrying out a stretching programme. The band 5 discussed what was realistically possible in terms of physiotherapy input, which improved the understanding of the medical team in this case.
- Whilst carrying out the stretching programme, the PTA noticed that the patient's legs were becoming increasingly tight.
- The band 5 was informed who discussed the patient with a senior colleague.

Reassessment

- A joint assessment was carried out and the following noted:
  - Difficult to assess muscle power or sensation as the patient was unable to communicate.
  - Increased tone was present in right shoulder and elbow.
  - Full PROM in both ULs.
  - Increased tone in both legs; hip adductors, knee flexors and TAs.
  - Unable to achieve plantargrade in both ankles.
  - Patient required maximum assistance of 2 to roll.
  - Assistance of 2 required for her to move from lying to sitting and back to lying.
  - Full sling hoist required for all transfers.
  - Assistance of one required to maintain sitting balance.
  - Head held in a position of side flexion to the right.
  - Patient began to engage a little more once her head was brought into midline.
  - On discussion with the senior physiotherapist, the following plan was made to address the problems:
  - Patient to be seen twice a week by the band 5 physiotherapist, PTA to continue with the stretching programme.
  - T-roll to manage high tone in lower limbs. For 2 hours on, 2 hours off. Nursing staff informed.
  - Scotch and soft casts for TAs (casts made by plaster room). To start wearing for 2 hours per day for the first week and then increase by one hour per week. Chart with instructions placed above patient's bedspace. Nursing staff to check for pressure sores and to alert physiotherapist if any problems.

– Discussion with regional neuro-rehab unit for botox in view of spasticity in lower limbs.
– Liaise with OT re: head support for patient when sitting out in wheelchair and for footplate adjustment.

Outcomes

- Problems that arose were addressed as follows:
  – Twice weekly treatment: occasionally it was not possible, e.g. due to a sick respiratory patient, in which case the PTA continued with the stretching programme. Treatments consisted of the tilt table and sitting balance work. The PTA also incorporated functional tasks into the stretching programme, e.g. assisting the patient to comb her hair with her left hand.
  – T-roll: a chart with instructions was placed above the patient's bed which worked very well.
  – Splints: initially the casts worked well. After 3 weeks, the cast for the right leg had to be removed as the patient developed a pressure sore on the posterior aspect of her calf. ROM in her left ankle began to increase gradually.
  – The patient was reviewed by one of the consultants working in the neuro-rehab unit and deemed suitable for transfer to the unit. (Botox injections were given after transfer to the rehab unit.)
  – Discussion with the OT about head support. There was no other head rest available, therefore a temporary one was made by rolling up a towel and placing this at the side of the current head rest. Footplates were adjusted to ensure the optimum position for the ankles when the patient was in the chair.

Conclusions

- Patients like these ideally require daily physiotherapy as recommended by the CSP guidelines.
- In a busy acute general medicine ward it is not realistic to provide this, therefore it is preferable to do the following:
  a). Discuss the case with your senior, assess the patient jointly and devise an efficient treatment and management plan.
  b). Combine treatment sessions, e.g. tilt table with stretching programmes carried out by the PTAs.
  c). Obtain further guidance from colleagues working in neuro-rehabilitation.
  d). Discuss the issues with the medical team and agree realistic therapy interventions.
  e). Liaise regularly with the OTs re: seating to meet patient's needs, or other professions to ensure the patient's needs are being met.
  f). Document clearly in the notes the treatment plans and any splinting charts.

Case Study 9.2

Background

- 68-year-old female.
- Lives with husband.
- Dependent on husband for all ADLs, no formal POC.
- Mobilises with assistance of 1.
- Wheelchair for outdoor use.
- Normally PEG fed apart from 3 spoons of yoghurt a day to take medication.

PMH

- Progressive supranuclear palsy – 'Parkinson's Plus' syndrome.
- Corticobulbar disease.

HPC

- Patient was admitted to the intensive care unit with SOB and productive cough.
- GP had prescribed antibiotics, with no response.
- Chest X-ray revealed RLL pneumonia.
- Whilst the patient was on ITU she was treated with oxygen therapy (Vapotherm), cough assist, positioning and nasal suction.
- She was reviewed by the consultant neurologist and it was agreed between the ITU and neurology teams that the patient should not be intubated due to her comorbidities.
- 4 days later she was transferred to the acute general medical ward.

Assessment on the medical ward

- Initially she was on 28% heated humidified oxygen. SaO_2 94%.
- Auscultation revealed crackles in RMZ and bases with decreased AE in the bases.
- Patient's bed mobility was assessed and she was able to transfer into sitting with minimal assistance of two.
- She had independent sitting balance.

Treatment

- She was then transferred to a chair with assistance of 2.
- Once she was sitting out, the cough assist was used to mobilise the secretions and to

increase lung volumes. SaO_2 increased to 98%.

- Cough sounded productive, but nothing was expectorated.
- Patient declined nasal suction as her nose was sore from previous suction.
- She was treated again in the afternoon and her mobility assessed further.
- At this point her husband was present and because of the amount of equipment around the bedspace and the need for 2 people to treat the patient, the husband was asked if he would wait in the day room.
- The husband said he didn't mind waiting in the bedspace whilst we treated his wife. It was explained why it would be helpful if he waited in the day room.
- He reluctantly complied with the request, but was evidently not happy.
- Auscultation revealed same as a.m., with her breathing room air, SaO_2 93%.
- Sitting out in chair the cough assist was used, again the cough sounded productive, but nil cleared. The patient again declined NP suction.
- She was mobilised for 15 metres with the assistance of two. Oxygen levels were SaO_2 95% post treatment.
- Following the treatment the physiotherapist went to the day room to talk to the husband. He felt that he was not welcome and wanted to go home. The physiotherapist apologised that he had been made to feel like that and explained why he had been asked to leave, how well his wife had done in the treatment session and that he would be welcome to join them for tomorrow's treatment when he visited.
- The husband revealed that on the night his wife was admitted he was told that she may not make it and he remained extremely distressed and worried, even though she was progressing well. After having discussed this he apologised for his actions, thanked the physiotherapist for all the help and agreed to join the following day's treatment session.
- The next session was a repeat of the previous afternoon. She transferred with 1 and was mobilised for 25 metres with assistance of 2.
- The provision of a gutter frame was discussed, but the patient declined to use one as her previous experiences led to her mobility being hampered.
- The afternoon session was carried out jointly with her husband who demonstrated how he assisted her by walking behind her with his hands on her waist.
- He had been given a handling belt in the past but this hadn't worked as it slid up when mobilising the patient and the husband had concerns about dislodging the PEG tube.

Outcomes

- The patient was reviewed over the weekend by the respiratory weekend service as patient at risk of deteriorating, due to the ineffective cough, the presence of secretions and reduced lung volumes.
- After the weekend the patient's chest was much improved; there were no crackles and lung volumes had improved.
- The medical consultant requested that the patient have a gutter frame to mobilise despite

it being documented in the notes the previous week that she did not find this a helpful walking aid.

- The patient continued to be mobilised by the ward therapists and the patient's husband to build exercise tolerance and maintain lung volumes.
- She was discharged home the following day.

Conclusions

- Combination of respiratory, neuro and rehabilitation skills were required for the management of this patient.
- Effective communication skills were required for use with patient, husband and medical team.
- Conflict resolution skills were used when the husband became upset (ability to empathise, apologise and resolve problem).
- The husband's input was very important for determining how patient's current level of function compared with her preadmission function.

Case Study 9.3

HPC

- 66-year-old female, admitted after being found collapsed.
- Patient confused with reduced mobility.
- Treated 3 days previously for UTI.
- Incontinent of faeces and urine.

PMH

- Type 2 diabetes, controlled by insulin. Diabetes poorly controlled as patient lacked insight into problem.
- Schizophrenia, usually stable.
- Hypertension.
- Hypercholesterolaemia.
- Obese.

Social history

- Smoker (12 per day).
- No alcohol.

- QDS POC.
- 1 nurse for insulin daily.
- 1 nurse for meds.
- Independent with ADLs.
- Normally independently mobile, able to do stairs but slowly.
- Lives in upstairs flat. CPN (community psychiatric nurse) had been looking into a new placement as prior to admission patient's mobility had been deteriorating and patient had been having falls.
- Does own shopping.

CT head showed caudate infarct.

On the evening of the day of the admission, patient began to deteriorate as identified by the track and trigger observational charts – increased HR and increasing SOB. Patient was diagnosed as having pulmonary oedema (?secondary LVF). ABG revealed hypoxia. Put on 15 L via NRBM. Patient was drowsy and sweaty. Patient given GTN and furosemide but no effect. Reviewed by ITU SpR as RR 40 and patient tiring. Patient taken to ITU for CPAP. Chest X-ray revealed RML and RLL pneumonia with superimposed pulmonary oedema. After 3 days patient was stabilised and transferred to medical ward.

Handover from AICU physio: patient stood between 2. SaO_2 95% on 2 L O_2.

- Day 1 post transfer to the medical wards:
  - On the first physiotherapy assessment a functional assessment was carried out with the physiotherapy assistant as the patient did not fully follow instructions regarding muscle testing and ROM in upper limbs and lower limbs.
  - Patient was independent with lie to sit and had independent sitting balance.
  - However, to get the patient to transfer to the chair took another 30 minutes as the patient became increasingly anxious and not wanting to comply. Patient did stand three times during the course of this but sat down immediately. The nurse looking after the patient was asked to help with transfer. Patient required a lot of reassurance and the purpose of sitting in the chair explained to patient again. Eventually the patient transferred to the chair with supervision of 3.
  - The goal after the initial treatment was to aim to mobilise to the end of the bed by the end of the week. Carer visited in the afternoon who reported patient didn't like being touched.
  - For the next 2 days patient refused to mobilise despite lots of encouragement, reassurance and use of positive instructions and giving patient a goal for the treatment session. The patient was also awaiting a psychiatric assessment. Discussed with the doctors that we would continue to review the patient until the end of the week but that patient's ability to engage with rehab was due to psychiatric problems and that it may be easier to rehab post psych review.
- Day 5: Son was present at the treatment session. Patient reluctantly agreed to mobilise. Patient SOEOB with 2 and then transferred back to bed independently.
- Days 8 and 9: Patient was sitting out with nursing staff. Inappropriate outbursts such as

‘all the haemorrhages were repugnant’. Patient managed four to six stands between 2. Posture very flexed, no correction despite verbal prompts. Unable to use proprioceptive prompts as patient didn’t like being touched and would become increasingly anxious. Briefly marched on the spot. During doctor’s review patient said ‘I don’t trust people’, ‘I don’t want to bounce on the air’, and ‘people are torturing’. With regards to discharge planning it was decided that a psychiatric rehab bed may be appropriate in order to address her psychiatric and physical needs.

- Day 10: Patient refused to mobilise stating: ‘I don’t want to walk on thin air.’
- Day 11: Patient managed four stands and mobilised to the end of the bed with a WZF and minimal assistance of 2.
- Day 12: Slightly more co-operative but still having inappropriate outbursts. STS with 2. Found counting patient in helpful.
  - Over weekend documented by nursing staff that patient transferring (I) at times, and others patient refusing.
  - Day 18: STS × 3 with min A of 2. Unable to take steps as didn’t stand long enough.
  - Psych advised transfer to unit which provides psych and physical rehab.
  - Day 19: Stood with min A of 2 x 3, taking a few steps after each. Mobilised to end of bed with WZF and 2. Lots of encouragement/positive reinforcement to get patient to continue.
  - Day 23: Sat out, flexed in chair and drooling +++. Patient needed lots of coaxing. Managed 5 stands with min assistance of 2. Inappropriate comments.
  - Day 25: Patient had transferred to commode independently.
  - Discussion with ward sister regarding rehabilitation. We both agreed that the patient should be given a chance to rehabilitate as patient had started to engage a little more with therapy and had made some progress (mobilised to end of bed). However no physio cover at psych rehab beds, only OT. Stood independently and mobilised to end of bed with supervision of 2 and WZF. Transferred back to bed independently.

Goals

1. Mobilise to end of bay and back in 1 week.
2. To mobilise to toilet with WZF and 2 in 2 weeks.

Discharge plans

The divisional director for medicine contacted the matron for the Mental Health Team as patient was a delayed discharge and that transferring patient to a suitable place for rehabilitation was extremely important. It was decided that the patient should be moved to a community hospital as there was physiotherapy cover there and the patient could still be followed up by the CPN.

- Day 26: Wanting to go back to bed but agreed to mobilise beforehand. Mobilised to end of bay with WZF and 1, rested in chair, then walked back and returned to bed (I).
- Day 28: Agreed to mobilise as before. STS (I). Mobilised 12 m with WZF bringing chair behind, rested then mobilised back and transferred to bed (I). Increasing motivation and compliance.
- Day 30 patient transferred to community hospital to continue rehab there.

Conclusions

Rehabilitation with this patient was challenging as the main obstacle was the patient's psychiatric problems. This case study demonstrates the need to build a rapport with the patient in order to gain their trust and subsequently allow them to engage in rehabilitation. Flexible communication skills were required such as the use of positive instructions, reassuring the patient and setting clear goals and aims of the treatment session at the beginning. It also demonstrates why it is important that all members of the MDT work together in rehabilitating the patient, i.e. patient sat out by nursing staff.

As patient's trust gained, able to talk to her a little more about things such as the jewellery she was wearing and her doll that she kept with her.

Highlights problems with delayed transfer of care and the need to move patient to a more suitable unit in order to address her needs.

Also demonstrates that daily physiotherapy is not always possible and why it is so important to ensure that there is an MDT approach to rehab.

Chapter 9 Medicine multiple choice questions

1. A patient is admitted with SOB and cough. Which of the following would not indicate that it was a respiratory problem?
   a). Pyrexia
   b). Raised JVP levels
   c). Colour and consistency of sputum
   d). Raised WCC
2. Which would not be an appropriate referral to physiotherapy?
   a). Patient with a long-term tracheostomy, admitted because of diarrhoea and vomiting. No change in respiratory status
   b). Patient from ITU, admitted with productive pneumonia
   c). Patient with infective exacerbation of COPD
   d). Patient unable to clear secretions effectively
3. Which would not be an appropriate referral to physiotherapy?
   a). 29-year-old with sudden onset of undiagnosed breathlessness
   b). 56-year-old male admitted with acute exacerbation of COPD
   c). 69-year-old female with a recent CVA
   d). 82-year-old male with reduced mobility and UTI

4. Which would not be an appropriate referral to physiotherapy?
    a). 78-year-old female admitted with a fall
    b). 44-year-old with fractured ribs and chest infection
    c). 86-year-old requiring stair assessment prior to discharge (lives alone)
    d). 91-year-old from a nursing home, normally hoisted and long history of lower limb contractures
5. What is the normal value for WCC?
    a). $3.5–11.0 \times 10^9/L$
    b). $4.5–11.0 \times 10^9/L$
    c). $6.0–11.0 \times 10^9/L$
    d). $6.5–11.0 \times 10^9/L$
6. What would a raised JVP indicate?
    a). Left-sided heart failure
    b). Pulmonary oedema
    c). Cardiomegaly
    d). Right-sided heart failure
7. What level do neutrophils fall below to class a patient as neutropenic?
    a). $0.01–0.5 \times 10^9/L$
    b). $2.0–7.0 \times 10^9/L$
    c). $1.0–2.0 \times 10^9/L$
    d). $10.0–12.0 \times 10^9/L$
8. Which is not a cause of hyponatraemia?
    a). Kidney disease
    b). CHF
    c). First-degree burns
    d). Decreased water intake
9. Which patient would be your highest priority out of the following?
    a). New CVA patient with dense hemiplegia
    b). Stair assessment for discharge. Patient to be discharged the following day
    c). New patient admitted with reduced mobility requiring 2 to transfer
    d). Patient admitted with infective exacerbation of COPD, ineffective airway clearance and desaturating to below target saturation levels
10. Which patient would be the lowest priority out of the following?
    a). Patient mobilising with the nursing staff on the ward
    b). Patient with predicted date of discharge
    c). Patient not seen the day before
    d). Patient with ongoing rehabilitation needs, awaiting a community hospital
11. Which of the following, associated with falls, would be referred for physiotherapy?
    a). Reduced eyesight
    b). Polypharmacy
    c). Syncope

d). Pain

12. What is a type of cue for patients with Parkinson's disease
    a). Patient counting out loud
    b). Stepping to markers on floor
    c). Rocking prior to sit to stand
    d). All of the above
13. Which would not indicate an MI?
    a). Increased troponin levels
    b). Chest pain
    c). Ischaemic changes on ECG
    d). Raised JVP
14. What is not a symptom of infection?
    a). Pyrexia
    b). Raised WCC
    c). Normal CRP
    d). Increased heart rate
15. What is the normal range for sodium levels
    a). 138–143 mmol/L
    b). 140–150 mmol/L
    c). 135–145 mmol/L
    d). 130–141 mmol/L
16. Which is a necessary skill when working in medicine?
    a). Prioritisation
    b). Delegation
    c). Time management
    d). All of the above
17. Which of the following is the least suitable outcome measure to do at a patient's hospital bedside?
    a). Berg balance
    b). Tinnetti mobility and balance
    c). Home Falls and Accident Screening Tool (HOME FAST)
    d). Timed unsupported stand
18. Which is not an objective marker?
    a). Amount of time a patient can stand unsupported
    b). Distance mobilised
    c). Muscle power
    d). Amount of assistance required to stand
19. You have a patient that is refusing to engage in therapy. Which of the following would be most helpful?
    a). Set SMART goals
    b). Inform medical team looking after patient
    c). Involving family/carers

d). All of the above

20. When does discharge planning begin?
    a). As soon as the patient is admitted to hospital
    b). Once the patient has had a physiotherapy assessment
    c). Once the patient is deemed medically fit for discharge
    d). Once the patient has been discharged by physiotherapy and occupational therapy

Medicine multiple choice answers

1. b)
2. a)
3. a)
4. d)
5. b)
6. d)
7. c)
8. d)
9. d)
10. a)
11. d)
12. d)
13. d)
14. c)
15. c)
16. d)
17. c)
18. d)
19. d)
20. a)

Chapter 10

Mental Health

Introduction

- As a student or newly qualified physiotherapist you may be expected to treat adults of working age or older adults in acute mental health wards, community mental health teams or outpatient settings such as gyms.
- Although it is possible that you will also work with adolescent patients or service users in eating disorder or forensic units, in these areas it is much more likely that you would be working under the immediate direction of a senior practitioner.
- For this reason the treatment plans considered in this chapter relate to referrals for assessment and consequent treatment of an adult with poor general well-being, an older adult with mobility problems and an inpatient in an acute stage of anxiety and depression experiencing musculoskeletal disorder.
- As with all specialities the holistic nature of treatment demands that it be part of a multidisciplinary approach which includes the patient/service user and where appropriate the carer/s.
- All aspects of the service user's life may affect outcomes, including social, environmental factors, alongside the psychomotor signs and symptoms, and so all aspects should therefore inform the approach and delivery of treatment.
- Treatment plans will be based on assessment and driven by goals chosen, or at very least agreed, by the service user (in the case of later-stage dementia the carer may be the person leading the goal setting).
- Goals may be long or short term and should mirror or dovetail with the psychological and social goals, which may already have been set between the service user and others in the team.

Mental Health Act and sectioning

- Patients may be in hospital voluntarily or they may be detained under a section of the Mental Health Act for their own or other people's safety. Detention is often referred to as 'Sectioning' which refers to a particular section of the Mental Health Act (HM Government 2007). A very specific process must be adhered to in sectioning someone and there are reviews and processes which must be followed including the right of appeal for the person.
- Whilst in hospital a patient may be cared for at a specific level of observation related to the assessed risk. Risks may be of absconding, self-harm, harm to others, lack of self care. The level of observation 1–3 refers to the frequency of observation and also the

proximity of the observer, for instance level 3, 15-minute observations mean that a member of staff would know where a patient was and what they were doing every 15 minutes but they could view this from a distance, 'level 1 observation constant observations' would mean a member of staff would be within arm's length constantly.
- Consider what this might feel like, especially if one already feels paranoid. The status of the patient will affect the treatment options you have. For instance if a walk is part of your treatment plan then a sectioned patient will have to have ground leave agreed by the responsible medical officer. In forensic settings it is likely that the majority of patients will be on section and will need ground leave which may have to be very specific, e.g. 30 minutes, within the grounds with two escorts between the hours of 10.00 and 12.00; or one hour to walk to and from shops with one escort. For some patients who are under a forensic section of the Mental Health Act permission has to be agreed by the Home Office.

Promotion of well-being

- It falls within the remit of the physiotherapist in mental health to promote well-being, which may encompass weight management plus advice concerning diet, smoking, use of alcohol and physical activity.
- Much will depend upon the resources available to you and the awareness of the team.
- Thus referral to the dietician, smoking cessation adviser or GP for review of medication, may happen via other members of the Community Mental Health team but if referral to the physiotherapist is the first action taken then the physiotherapist needs the knowledge and skills to refer on or to signpost to the most appropriate service.
- A referral is likely to come from the care co-ordinator or possibly self referral from the service user and to be for increase in fitness and reduction of weight.
- Following musculoskeletal assessment and treatment of any specific disorders the goals for general well-being should be set.

Adults with enduring mental health disorder

- For patients with long-term and enduring mental disorder lack of motivation will be, and will have been, a major barrier to fitness. If the service user has been on psychotropic medication for many years then weight gain will have occurred but the lack of activity and diet are likely to be key factors in lack of well-being.
- Patients with long-term and enduring mental disorder are four times more likely to die of cardiorespiratory diseases than are the general population (Phelan et al 2001).
- The body of evidence linking diet with mental health is growing at a rapid pace. As well as its impact on feelings of mood and general well-being, the evidence demonstrates diet

contributes to the development, prevention and management of specific mental health problems (Mental Health Foundation 2007).

- Musculoskeletal assessment should have included checking joint range, muscle power, reported pain but should focus on function.
- Questions about what the service user can and can't do physically and what if anything he wants to do about it should be the basis for intervention.
- Specific measurement of body mass index (BMI) and waist circumference may be appropriate on initial assessment or may cause distress and need to be addressed at subsequent appointments.
- The expertise of the physiotherapist should be initially employed to assess and treat any musculoskeletal disorders such as painful joints or injured muscles in preparation for a physical activity programme.
- In many mental health settings technical instructors (TIs), with a background in sport and physical fitness, work with the physiotherapists and can be very effective in delivering the activity plan when it has been devised.
- In some mental health gyms the TIs have a lead role and physiotherapists are involved only if there is a specific need due to injury or physical disorder.
- For patients with low motivation self-reporting questionnaires do not always provide full histories or clear progression lines. An interview screening tool with review will be more useful and can be administered by either the physiotherapist or the technical instructor.
- In this case the physiotherapy student or novice physiotherapist may learn from the experienced non qualified staff member the best way to approach a service user.
- Reviews rating to the baseline screening should take place at regular intervals being sure to involve the service user in a way which is meaningful to them.

Suggested treatment goals

- Long-term goals
  - Increased fitness level
  - Reduced weight
  - Improved motivation/mood/confidence
  - Increased level of general activity
  - Reduced joint pain on activity.
- Short-term goals
  - Attendance at sessions
  - Treatment of musculoskeletal disorder
  - Improved diet
  - Maintenance of weight
  - Acknowledgement of need.
- The short-term goals for a person with low motivation and possible fatigue due to lack of activity must initially be about identifying need and encouraging regular attendance.
- This can be facilitated by the use of treatment contracts where the service user agrees

both goals and ways of achieving the goals. Contracts provide a structure to describe the methods to be used and this can help the physiotherapist devise relevant and interesting programmes for the service user.

- Motivational interviewing (MI) skills are a useful technique in these circumstances as they encourage the service user to direct the change. Originally used for counselling 'problem drinkers' the interviewing technique produces a relationship which reflects partnership rather than following an expert–recipient model (Rollnick and Miller, 1995).

The question of weight

- A service user may be morbidly obese to the point where even the effort of rising to standing is exhausting.
- Alternatively the service user may have been neglecting to eat regularly and have a low BMI which may cause concern in terms of sufficient calorific intake to support exercise.
- If the decision is to provide a physical activity programme then weight must be considered. Each person's needs should be considered individually but a BMI below about 18.5 would militate against anything other than very gentle exercise and stretching.
- All multigym machines will have a specific weight limit and the service user's weight may exceed this. Always check before suggesting use of exercise machines.
- For extremes of weight levels some useful forms of exercise are:
  - Seated gentle exercise with progression to aerobic seated exercise
  - Simple sit to stand repetition
  - Walking routes which include seated stops
  - Stretches.
- A slow start, mild to moderate level exercise should be planned first and explained carefully to the service user as part of their treatment plan and goals.
- Progression from individual forms of exercise should happen at a pace which encourages the service user to continue with activity and /or exercise, until it becomes part of that person's habit.
- Examples of progression:
  - Use of a multigym (Figure 10.1)
  - Semi-competitive games
  - Swimming
  - Dancing
  - Or even fishing (there is a lot of walking and carrying involved before and after sitting quietly next to a lake or river)
  - Any other activity of daily living which the service user sees as important.
- At this point in the treatment new musculoskeletal disorders may become apparent and they should be assessed and treated as part of the total treatment pathway.
- However the physiotherapist should be ready for intermittent attendance, relapse in illness or poor concordance with diet regimens all of which will interfere with goal time

lines.

- Patience and innovation in treatment intervention can make a long process more successful.

<table>
<tr><td colspan="3">Gym Referral</td></tr>
<tr><td colspan="3">1st Appointment
Health Questionnaire
Equipment Induction
Taster Gym Programme</td></tr>
<tr><td colspan="3">Regular attendance
Establish goals of gym attendance and begin</td></tr>
<tr><td colspan="3">1st 4 week Review of Goals
? Achieving goals
? Change in programme/equipment used</td></tr>
<tr><td colspan="3">Report sent to referrer re: progress
Discuss Progression to local leisure facilities (as appropriate)</td></tr>
<tr><td colspan="3">Continue Regular Attendance
Continue with monthly reviews</td></tr>
<tr><td></td><td colspan="2">Some drop out e.g.
returned to work, going
to local gym, discharged</td></tr>
<tr><td colspan="3">Escorted visit to Local Gym</td></tr>
<tr><td>No</td><td colspan="2">Yes</td></tr>
<tr><td>Clear Clinical Decision why not</td><td colspan="2">Repeated visits as required</td></tr>
<tr><td>Continue with Physio. Gym</td><td>unhappy</td><td>happy</td></tr>
<tr><td rowspan="2">- Clear goals set
- 6 months max at this stage
- May attend local gym in future</td><td>Return to Physio. Gym</td><td>Continue on Own</td></tr>
<tr><td colspan="2">- Education of leisure centre
- Offer support to Centre
- Discharge report</td></tr>
<tr><td colspan="3">At any time if no attendance for 6 weeks, a new referral is required and the pathway starts again</td></tr>
</table>

Figure 10.1 Example of a multigym patient pathway.

Specific outcomes

- Measurement such as BMI, waist circumference can be used to show weight reduction.
- To evaluate endurance the measures could include
  – Distance walked with ease
  – Timed measured walk
  – Levels of repetitions in multigym programme
  – Patient self reporting measures can be really useful to demonstrate changes in confidence and motivation but also in physical activity
  – The BORG Perceived Rate of Exertion Scale (Borg and Borg 2001) (Table 10.1).
- A subjective measure fulfils the basis of our treatment to give back to the patient some feeling of control over their body and what they are capable of doing with it.
- The service user is invested with the means of regulating how hard they are working whilst at the same time the therapist has some means to demonstrate improvement.
- A regular visual analogue scale with fearful or unhappy at level one and very confident or

happy at level 6 can be applied to any of the activities agreed as ways to reach goals or functions which were identified as difficult.

- It cannot be emphasised enough that the baseline for all of the strength and stamina measures is likely to be very low compared to expected norms, so improvement no matter how small will be a health gain.
- The gain in fitness from completely sedentary lifestyle to a moderately active lifestyle occurs at a much faster rate than gains in moderately active to a very active lifestyle.
- Completion of treatment should take the service user to independent (or support worker aided), use of community facilities in leisure centres, swimming pools, walking groups. The student or novice physiotherapist may not be with the service user long enough to reach this point, but they will have put them on that path.
- Although we may be the physical expert it is well to remember that in reducing pain, increasing activity and supporting personal achievement will affect the patient's mental well-being and contribute to raising mood, structuring the day and giving an improved sense of mastery.
- In this way the physiotherapist is truly working holistically.

Table 10.1 The Borg CR10 exertion scale

0	Nothing at all	'Number 1'
0.3		
0.5	Extremely weak	Just noticeable
0.7		
1	Very weak	
1.5		
2	Weak	Light
2.5		
3	Moderate	
4		
5	Strong	
6		
7		
8		
9		
10	Extremely strong	'Strongest 1'
11		
	Absolute maximum	Highest possible

Older adult mobility in dementia

- For the older adult patient mobility is the most frequent cause of referral to

physiotherapy.

- Physiotherapists in many specialties including the 'core' areas of musculoskeletal, neurological and cardiorespiratory will encounter patients with dementia and with an aging population this will become more common.
- The following treatment suggestions are focussed on the approach and possible treatment goals for a patient with moderate dementing changes.
- The classic work of Rosemary Oddy initially written for carers and relatives is a useful resource when treating patients with dementia (Oddy 1998).
- In early stages of dementia the difficulty may be poor mobility, however in later stages the referral to physiotherapy may be to advise on lowering the level of activity.

Treatment goals

- Following assessment the treatment plan will always include achieving safe movement in functional situations, thus, moving in bed, getting in and out of bed, sitting to standing and reverse, stabilising base to allow reaching.
- The other essential is to provide advice to the team and relatives or carers regarding safe management of mobility for the patient.
- Specific goals may be to:
  - Increase core strength
  - Increase confidence
  - Support management of mobility by the multidisciplinary team (MDT) and carers
  - Reduce excess mobility.

Aspects of dementia which will affect treatment

- All the impairments which may accompany dementia will not necessarily be seen in one person, but there are a number of symptoms which will affect both the approach to and the success of treatment.

Memory

- Patients with early-stage dementia may find mobility difficult because they begin to go somewhere and then forget why and where they are walking, or they forget that they have difficulty moving which produces a severe falls risk.
- In later stages memory may be so poor that instructions are forgotten almost immediately after they are heard.

Cognition (thought processing)

- Processing instructions becomes difficult and can prove impossible if too complicated.
- Usually when an instruction is given the response is fairly immediate and for functional activities the movement almost automatic.
- For the dementing patient a simple instruction such as stand up may not happen automatically and in trying to think about it the patient can become frustrated.

Perception

- Spatial perception is often affected along with processing of visual input.
- So a space between chairs may be perceived as a chair.
- Changes in flooring from carpet to hard floor or from pattern to plain may be perceived as a step.

Orientation

- The ability to recognise time and place may be lost and a person may be convinced that they are somewhere and in some age other than where they are.
- Very often patients will have a clear reason why they cannot come with you or get out of bed or why they must leave the ward, e.g. 'I am waiting for my son' or 'I have to get home to feed the dog and the bus leaves in 10 minutes'.
- It is therefore important to know something of their history and consider the likelihood of the statement.
- Positional orientation may also be affected and a patient may become distressed if moved too quickly from one position to another so allowing adequate time as discussed previously is of the essence.

Emotional affect

- Depression often precedes or appears alongside dementia and this will have an affect on motivation which may already be low due to the cerebral change associated with dementia.
- Anxiety and fear are common symptoms.
- The anxiety may be specific or global resting on any thought which appears.
- Fear due to reduction in ability to make sense of the environment or to persecutory thoughts may be compounded by a specific fear of falling.

Dual tasking

- Often dementia rids the person of the ability to concentrate on two things at once.
- This is most clearly seen in walking with instruction.
- Instruction should always happen first and if adjustment is needed then walking should be paused, to allow processing of the instructions to take place.

Treatment approach

- The approach is derived first from the attitude of the student or novice physiotherapist who should have a positive attitude and be well motivated; be sympathetic to the individual's difficulties recognising that dementia will affect different people in different ways and ensure that the patient is treated with dignity and respect.
- The key is to plan for success whilst using your skills to make movement enjoyable and including the team, carer and relatives in the plan.

Specific strategies

- Effective communication is essential to influence the different aspects of a patient presenting with dementia.
- Communication techniques comprise of verbal and non-verbal strategies including:
  - Single clear instruction
  - Repetition or rephrasing
  - Calm tone of voice
  - Visual and auditory cues, e.g. pat the seat or the pillow to show where you want the person to move to
  - Suggest a purpose, e.g. 'let's go to look at the garden'.
- Physical techniques
  - Use hand gestures to show the direction of movement
  - Rather than pointing take your hand from in front of the patient's chest and move it with an open hand gesture which invites the patient to move forward
  - Walk in unison
  - Walk beside the patient, supporting if necessary with the open palm hand support and one hand on the back
  - Use your body to give close support if necessary
  - Use motor memory to aim for automatic movement, e.g. for movement on the side of the bed try invading the person's space slightly by sitting very close to them. Usually they will move automatically up the bed
- To reduce fear:
  - Try to discover what is frightening to the patient about moving
  - Use reassurance and tone of voice
  - Fill the gap as people with dementia who have a fear of falling will find this exaggerated when there is a large space in front of them and therefore will probably refuse to stand up
  - Use a person or a chair in front of them to reduce the sense of space
  - A walking frame often does not help because the patient is able to see through it and does not discern it as being something which can be leant upon
  - Ensure the environment is safe and if possible familiar.
- In all cases allow enough time for the patient to receive the request, process the request

and then carry out the actual response.

Treatment techniques

- To increase mobility and core strength and reduce fear of falling exercise can be provided in many ways.

Individual intervention

- The Otago falls prevention system is clear and can easily be adapted for use with people in early stages of dementia.
- It consists of a series of leg-strengthening and balance-retraining exercises and a walking plan that gets progressively more difficult as the patient gets stronger.
- The repetitious nature of the programme uses the motor memory and therefore has more chance of success (Campbell and Robertson 2003).

General activity

- Simple guided walks, supervised swimming may be possible in the early stages.
- Use of equipment such as weights, multigym, balls can be difficult due to the need to process multiple movements; however, experience shows us that automatic movement can be elicited by use of balloons, scarves and particularly music.

Group exercise

- Groups give an extra dimension to exercise and can be useful in early-stage dementia for motivation.
- If the group is co-facilitated for example, an occupational therapist and a psychologist the opportunity to encourage memory by reminiscence, cognition by interaction and challenge alongside physical activities can be provided.
- A wonderful example of this is dance, as provided by a team of dancers, musicians and film-makers who create opportunities for people to indulge in movement play that aims to improve life (http://www.jabadao.org).
- Historically, ballroom dancing has been used with amazing results, for patients who have no motivation to move and may be seen as immobile. They will often rise from their chair and begin to dance if the music and environment are appropriately stimulating for them.
- As most demented patients vary in age from 65 to 100 appropriate dance music should be used from the 1920s to 1950s and 1960s, with rock and roll possibly becoming more popular and taking over from ballroom.
- Tai Chi has been used very successfully as a joint mobility and strengthening exercise.
- One of the elements of Tai Chi is that the movements can be performed just by following

the group leader without verbal instruction and this can be very calming for patients with dementia as it avoids dual tasking.
- For some, community walking groups can be a great way of including relatives who value doing something 'normal' with their spouse or parent.

Managing excess mobility or continuous walking

- As the disease progresses, lack of motivation and changed perceptions, which earlier had reduced mobility can be superseded by behaviours that suggest a deep need to move.
- The driving force for the patient may be the desire to get somewhere which is important to them, for instance their childhood home or workplace.
- The physiotherapist can work with the patient and team/carers/relatives to find triggers to help the patient to stop and to sit.
- Triggers could include arranging chairs on the favoured walking route, offering the person a drink or food or noting which member of staff or relative has the best connection with the person and with whom they might sit for even a short time.
- Identifying what interests the patient has and using these to generate a focus with the potential for producing some rest time.
- A care plan should include rest times during the day which follow an agreed pattern, e.g. if the person sits to eat a meal then that is followed by the opportunity to lie down for an hour.

Collusion

- There is debate around the use of collusion to link to ideas that a patient has that are part of the delusional aspects of dementia.
- A patient may wish to phone his or her mother who has been dead for 20 years or is very anxious that he is not at home to feed his children who are now parents themselves.
- Alternatively someone may have memories of being incarcerated, perhaps in a prisoner of war camp and may perceive a locked door as proof that he is still incarcerated and must try to escape.
- To achieve mobility collusion is sometimes considered.
- Saying 'let's go and see where your mother is?' might produce the required motivation and may achieve the goal of increased mobility, but for the patient frustration will be heightened.
- Care must be used and honesty is important if any understanding is to continue. Thus the real situation should be kindly and clearly explained and this should be and will have to be repeated as if it is the first time it has been said.

Advice to carers and relatives

- The skills you have used to encourage mobility and retain strength in the patient need to be translated into useful tips for the carers and relatives who have to maintain safe mobility in the home.
- A crib sheet with scenarios relevant to the patient and suggested management can be very useful.
- For some relatives seeing and trying techniques are more effective than written information alone.

Outcome measures

- Timed up and go.
- EMS Elderly Mobility Scale.
- Falls assessment (FRat).
- Smiling faces.
- General increase in manageability.
  - Whatever methods are used remember always plan for success, use a wide range of verbal and non-verbal communication skills and always allow sufficient time for response
  - This may lead to mobility in the demented patient being maintained or even improved.

Adults with anxiety disorder

- Physiotherapy skills can be used directly to affect mental health disorders.
- In a referral where a musculoskeletal problem has been diagnosed it may be clear on examination that without addressing the high levels of anxiety a clear indication of the underlying problems associated with neck or lower back pain cannot be seen.
- In some areas liaison between mental health and outpatient physiotherapy services is such that patients initially referred to outpatients are re-referred to the mental health specialist to assess and reduce physical manifestations of anxiety before the musculoskeletal specialist treats the spine.
- In other cases the mental health physiotherapist will use specific skills in anxiety management before using the usual musculoskeletal techniques.
- Physical symptoms of anxiety include muscle tension, raised heart rate, shallow and fast breathing, sensations of heat, paraesthesia, blushing/flushing, aching muscles, fatigue, migraine, difficulty swallowing.
- As physiotherapists we have techniques which can reduce these symptoms and working with the MDT we can cofacilitate reduction in anxiety-provoking triggers.
- Anxiety disorders comprise of a number of distinct illnesses which are defined by the Diagnostic and Statistics Manual of Mental Disorders (American Psychiatric Association 2000), or the International Classification of Diseases ICD 10 (World Health

Organisation 2011).

- Specific anxiety disorders include panic disorder, panic disorder with agoraphobia and obsessive–compulsive disorder.
- It is important to note that anxiety and depression occur together more often than they occur alone, where depression is present it will be treated by medication and can be positively affected by some of the physiotherapy treatments directed towards anxiety.

Goals

- Reduction of physical signs of anxiety.
- Patient confidence in self-help techniques.
- Reduction of pain.
- Increase in independence.
- Increase in physical function.

Treatment techniques

- Initially musculoskeletal assessment may be possible but may be compromised by the level of anxiety both in terms of thoughts and physical signs of anxiety.
- Presuming that the physiotherapist or student will have gained basic musculoskeletal skills elsewhere then the focus here will be on how anxiety might be addressed by physical and within the team, psychological means.

Massage

- Massage is a core physiotherapy technique which can prove very effective in treating muscle tension and anxiety (Diego et al 1998).
- In a mental health setting it is most usual to provide massage for hands, feet or head and neck. Centring treatment on distal areas reduces the need for removal of clothing, allows treatment to be offered without the need to find a specific treatment room, reduces the need for specific chaperones (although each case should be risk assessed on an individual basis).
- Whole body massage is rarely appropriate, but as a treatment for a patient with long-term recurring anxiety it can be used.
- The agreement of the patient is essential and explanation to the patient may include demonstration of the process on a colleague.
- Techniques that produce muscle relaxation should be used and may include the Western system of effleurage, gentle kneading, picking up for larger muscles, plus methods which the physiotherapist has trained in, for instance, reflexology, Indian head massage, aromatherapy massage (Fritz 2008).
- For all non-core massage techniques the physiotherapist must have evidence of training

and must comply with their organisation's policy on complimentary therapies (CSP 2001).

- Evidence collected by the Chartered Society of Physiotherapy for the Mental Health NHS Framework notes that 'numerous studies have been published related to the effects of massage and lowered levels of anxiety (Field et al 1996). These studies have utilised a wide range of study designs including randomised controlled trials (RCTs). The outcome measures used within these studies have included saliva cortisol levels and self-report measures for anxiety such as the State-Trait Anxiety Inventory (Spielberger 1980). However, these studies have not considered people with diagnoses of anxiety or long-term mental health disorders, but rather groups of the general population. The major limitation of these studies is that the population samples are primarily groups of healthy individuals who do not have a recognised history of clinical anxiety.

Relaxation training

- The physiotherapist may have some training in relaxation techniques from other areas and these skills will be useful for use with patients in the mental health setting.
- In mental health relaxation is vital to enable effective treatment to be implemented in the many subspecialty areas of mental health physiotherapy practice.
- There are numerous techniques that the physiotherapist can use and the choice of technique will depend upon the need of the service user, the level of anxiety, demeanour of the service user and the skills of the physiotherapist.
- Relation training may be given individually or in a group.
- Relaxation techniques are practised by many people in the mental health team, including occupational therapists, psychologists, nurses and psychiatrists as well as physiotherapists.
- The physiotherapist may be expected to provide a physical-based relaxation technique only, but there is no need to be confined to this. The physical relaxation measures include fostering and establishing body awareness of looseness in one's joints, biofeedback, focussing one's mind and thoughts on letting the muscles relax, and developing body awareness of the tension on one's muscles.
- Physical techniques include Jacobsen also called progressive muscle relaxation, Mitchell, hold/relax and diaphragmatic breathing.
- Alongside physical methods we may use guided imagery, visualisation, covert rehearsal, autogenic and more (Donaghy and Payne 2010).
- Jacobsen's technique is essentially a two-step process, which involves relaxing and tensing various muscles.
- Practice is essential for the service user to understand which muscles are usually tense for them and to feel the link with relaxation. It is generally recommended to begin from the feet and move upwards. Starting with the right foot, then proceed to the left, and then to the calves, thighs and so on. Tensing and relaxing each muscle in turn, this process should be repeated on each muscle working right up the body to scalp. To gain the most

out of this exercise, breathing techniques should be added and taught carefully, e.g. diaphragmatic breathing.

- The Mitchell method was developed by Laura Mitchell in the 1960s, her reasoning was based around the concept that many muscles work in opposing pairs, for example the 'biceps' and 'triceps' muscles. When one contracts the other must relax. So when you flex the elbow, the 'biceps' muscle contracts, to enable it to do so, the 'triceps' muscle must relax. Thus the Mitchell relaxation method is based on the simple principle of contracting certain muscles to encourage their opposites to relax (Appendix 10.1).
- Each physiotherapist will have a method or methods which they prefer, experience will be the best teacher as evidence for specific techniques is limited. For the treatment method with the best evidence base available the Jacobsen method should be considered.
- Awareness of tension is the first step to being able to reduce abnormal muscle tension. Many service users who have held tension in their muscle for years cannot recognise it as such because for them it is 'normal'.
- A useful method for demonstrating tension is to use the half body or awareness method (it has many names and is adapted in many ways).
- The method consists of using a script which allows the person to focus on one side of the body first and then getting them to compare the more relaxed side with the 'normal' side.
- With the person in lying or reclined sitting the instructions may begin as follows:
  - 'Focus just on your right foot
  - Be aware of how your foot feels
  - Notice what is touching your foot ... the floor ... the mat ... your sock
  - Be aware of the position of your toes
  - Feel the heaviness of your foot resting on the floor'.
- The script would then continue up the right side of the body bringing the person to awareness of the right knee, thigh, right side of back as it touches the supporting surface, right hand, arm, right side of neck, face and scalp.
- Then the physiotherapist would ask the person to notice any difference in feel comparing the right to the left side.
- Following that the script would be repeated for the left side to bring the body back to balance.

Breathing techniques

- Breathing techniques can be taught in isolation, but usually work better alongside physical or psychological relaxation.
- The use of diaphragmatic breathing may be well known to novice physiotherapist from their work elsewhere. As the name suggests it is the engagement of the diaphragm to produce deep controlled breathing which should give the most effective opportunity for perfusion of oxygen to the bloodstream.
- In the anxious patient, especially one who has a long-term anxiety disorder shallow

breathing may be the norm and requesting that the person take a deep breath may in fact be frightening initially.

- Allow the service user to go at their own pace and just to start with slowing the rate of breathing.
- A simple technique is to ask the patient/service user to count how long an in breath takes and then allow the out breath to last one count longer. This can then be progressed to extending the in breath too.
- Care should be taken in relation to teaching breathing methods.
- Risk of unleashing prior memories needs to be monitored. Always note what reaction a service user has when asked to lower the level of breathing, i.e. to take a deep breath and feel it in the lower belly, abdomen.
- If the service user appears to become much more anxious or places their hands protectively over their lower abdomen it may be that a memory of abuse has been elicited. Although not common, if this behaviour is seen the physiotherapist should find a different way to change breathing habits and should discuss this with the team.
- It is not the physiotherapist's place to ask the question or counsel the service user.
- If the service user discloses abuse the physiotherapist must make it clear that they have a duty to discuss this with the care co-ordinator.
- One easy rule to give a person who is breathing quickly and possibly beginning to panic is 'Just breathe out' although this seems oversimplistic it works well and is very effective in catching the first symptoms of panic before they escalate to a panic attack.
- Other methods including 'Yoga' breathing, huffing and 'laughter therapy' can be effective in changing anxiety-based breathing habits.
- For some patients focussing on breathing can make their anxiety worse and may aggravate any symptoms related to swallowing difficulties. If this occurs try to find another method of reducing tension which may act as an adjunct to reduce poor breathing habits.

Guided journey

- An imaginative or guided journey is a verbal relaxation system, which taps into the cognitive art of relaxation.
- The script should include visualisation of a pleasant environment and movement from one place to another. For instance a beautiful garden, focussing on colour, shape, sound, smell. Take the patient for a walk around the garden in their imagination.
- It is better to create a place for the patient rather than ask them to remember a real place as the emotions attached to real memories can evoke both happiness and sadness and not necessarily relaxation.
- Take care not to use scenes which frighten the patient, e.g. high mountains, deep water, all this should be addressed in the assessment but if working in a group you may not have individual assessments, so be aware of the possible negatives in scene setting.
- In addition to taking the guided journey, positive thoughts may be added and physical

triggers given to allow the patient to return to the setting described or the physical relaxation achieved quickly in other environments.

- The additional techniques are best taught practically and although outlined here the advice to novice physiotherapists would be to observe an experienced therapist before attempting positive thought addition.
- Triggers that can be added to both physical and cognitive techniques include the use of trigger words which might describe the physical feelings of relaxation, e.g. loose, heavy, floating. Alternatively triggers which relate to emotions or cognitions, e.g. calm, chilled, restful.
- Physical triggers or cues should be very simple such as pressing together the index finger and thumb and again this can be done alongside the word cues and provide a way of relaxing in public situations and for treatment purposes when coming to the physiotherapist for treatment of pain or dysfunction.

Acupuncture

- The physiotherapist may be trained to use acupuncture for pain reduction but it has been shown to be effective in both general relaxation and well-being and is used specifically in reduction of withdrawal symptoms for service users on opiates and alcohol detoxification programmes (Tyndall 2003).
- The technique used is called the 'five point protocol' and this protocol can be used prescriptively and therefore can be taught independently of a whole acupuncture qualification.
- Although used in detoxification programmes using this protocol, physiotherapists should only apply the technique following accredited training and within the CSP scope of practice and also adhere to the policy structure within their employer organisation.

Joint working for cognitive behavioural therapy (CBT)

- The physiotherapist may treat the patient with musculoskeletal disorder alongside anxiety as part of a cognitive behavioural approach which is led by another member of the multidisciplinary team.
- This approach may acknowledge that the patient's perception of pain is related to anxiety itself or to the triggers, which stimulate both anxiety and pain.
- CBT is a type of therapy that aims to help the service user to manage their problems by changing how they think and act.
- It is an approach which physiotherapists are using more often in the treatment of chronic pain and long-term conditions.
- CBT encourages the patient to talk about:
  - how they think about themselves, the world and other people
  - how their actions affect their thoughts and feelings.
- By talking about these things, CBT can help to change how the patient thinks about pain

or anxiety and enables them to recognise the triggers for either or both (Beck 1985, Bourne 1995).

- Unlike other talking treatments, such as psychotherapy, CBT focuses on the problems and difficulties which are current, rather than issues from the past.
- Focus is on practical ways to improve the patient's state of mind and manage anxiety on a daily basis. An ethos which can be reflected in the physiotherapist's approach to pain management.
- In the treatment of generalised anxiety disorder CBT has been found to be more effective than psychoanalysis and other forms of non-directive counselling or behavioural interventions including relaxation training used in isolation.

Anxiety management programmes

- – The physiotherapist may facilitate an anxiety management programme with other members of the MDT.
- – The level of input will vary and often depends upon the structure of the team and the skills within the team.
- – The physiotherapist's input may be to provide relaxation training and to give a teaching session on the effects of exercise and activity, or they may be much more involved and provide sessions relating to the panic cycle (Figure 10.2), fixed thoughts, cognitive errors, symptoms of panic both physical and psychological, goal planning, distraction, reframing and other anxiety management techniques.
- – As part of an anxiety management programme panic disorder and panic attacks may be successfully addressed.

- Panic disorder is an extreme form of anxiety disorder usually triggered by stress or by environmental or emotional factors (Table 10.2).
- Recurrent panic attacks are a feature of panic disorder and are very disabling leading to people being housebound for years in some cases (http://www.nhs.uk/Conditions/Panic-disorder/Pages/Symptoms.aspx).
- A panic attack may occur when you are treating a patient.
- Their body will experience a rush of intense psychological and physical symptoms.
- They may feel an overwhelming sense of fear, apprehension and anxiety.
- As well as these feelings, they may also experience physical symptoms such as:
  - – Nausea
  - – Sweating
  - – Trembling
  - – Palpitations or irregular heart rate.
- The patient needs to be supported and led to understand that although it can be very frightening and intense, a panic attack is not dangerous and will not cause any physical harm.
- Just being with the patient and helping them to see the panic through to resolution and return to normal function is important.

- Relaxation may help in lowering the threshold of anxiety level and therefore reduces the likelihood of a panic attack.
- Breathing techniques can help, as can the use of a trigger and cues for relaxation.
- All of these will go hand in hand with cognitive work done by the team.
- If it is the environment which has triggered the attack then planning and graded exposure can help and should be part of a patient's programme.

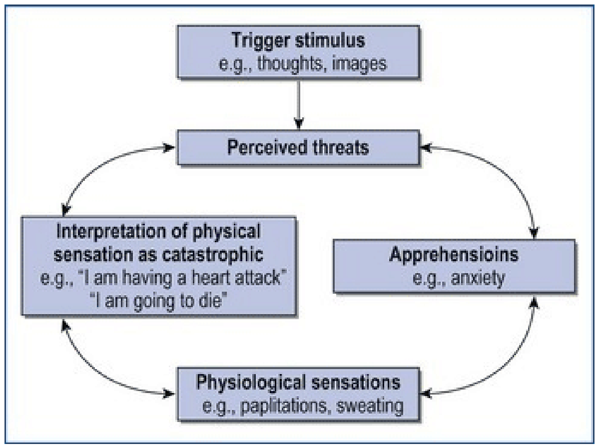


Figure 10.2 The panic cycle.

Table 10.2 The component symptoms of panic disorder

Component	Prominent features
Emotion	Severe and incapacitating anxiety
Cognition	Thoughts of dying, going mad, or losing control
Behaviour	Escape, avoidance, safety seeking
Somatic symptoms	Sympathetic arousal, e.g. sweating, palpitations, hyperventilation
Associations	Depression, agoraphobia, substance misuse

Exercise and activity and the influence on anxiety

- The effects of exercise on anxiety have been discussed in the NICE guidelines on depression and described in many studies which provide consistent findings of a link between exercise and anxiety reduction (Scully et al 1998, Biddle and Mutrie 2007).
- The literature suggests that the beneficial effects of exercise in alleviating anxiety seem to be stronger for those reporting greater initial stress.
- As stated by Donaghy and Durward (2000) in the CSP evidence for the Mental Health NHS Framework, 'although there is no consensus of opinion on the level of exercise intensity or its duration, the greatest trait anxiety reducing effects appear after 20 minutes and when training occurs over a minimum period of 10 weeks (Petruzzello et al 1991).'

- The input a physiotherapist might be able to give in an inpatient environment may not reach the levels suggested in the evidence, but the use of group walks, multigym programmes, competitive games may all be used as part of an anxiety-reducing treatment plan.
- The anxiolytic (anxiety-reducing) effects can only be said to relate to generalised anxiety. Some studies have included clinical populations with increased generalised anxiety; however, many of the studies have been undertaken with student and normal populations and a very small number of studies have included inpatient psychiatric clinical populations with specific anxiety disorders.
- Some experimental studies indicate that exercise has a low-to-moderate anxiety reduction effect, with positive evidence that single sessions of moderate exercise can reduce reactivity to, and enhance recovery from, psychosocial stressors.
- Exercise has similar outcomes to other non-pharmaceutical interventions such as counselling and relaxation.
- This information may be something that the physiotherapist has to promote in the therapeutic environment.

Outcomes

- Self-reporting measures can be used for stress reduction, but the ease with which an assessment of the musculoskeletal disorder accompanying anxiety can be made compared to the difficulty with reaching a diagnosis initially is a clear outcome measure.
- Reduction in pain scored on a visual analogue scale.
- Easing of activities of daily living, and social interaction are also good subjective measures.
- Thus physiotherapy can provide a range of treatment options to treat anxiety alongside or independently of musculoskeletal disorder.

Conversion disorder

- The final focus of treatment in mental health is one which will be experienced less frequently for most physiotherapists, but for those in specialist units may be seen on a daily basis, is conversion disorder, which is sometimes referred to as somatisation.
- Signs and symptoms of conversion disorder typically affect movement or senses, such as the ability to walk, swallow, see or hear.
- Conversion disorder symptoms can be severe, but for most people, they get better within a few weeks.
- Conversion disorder symptoms may occur because of emotional distress or psychological problems.
- Symptoms usually begin suddenly after a stressful experience.
- People are more at risk for a conversion disorder if they also have a medical illness,

dissociative disorder, or personality disorder.

- Some doctors falsely believe that conversion disorder and similar disorders are not real conditions, and may tell patients that the problem is 'all in your head'.
- However, these conditions are real and they cause real distress and cannot be turned on and off at will.
- Research on the mind–body connection may eventually increase understanding of these disorders.
- They are classified using the ICD-10 tool as dissociative (conversion) disorders, which suggest the symptoms arise through a process of dissociation.
- Patients are likely to be seen in specialised units, but may also be encountered in acute mental health wards, neurological wards and in the community.

Treatment

- There are different conditions under the label of conversion disorder which may support the choice of one of several models of treatment available to the physiotherapist.
- A patient's condition may be described as somatising, which means that for them the symptoms are real, despite no medical evidence being found.
- Some patients may know that the symptoms are not real and be using the symptoms for some sort of gain, either financial or personal in terms of attention or importance.
- A physiotherapist may be involved in coming to a decision as to which type of disorder it is, but it is not the role of the novice physiotherapist to make that decision independently.
- The appropriate model of approach is adopted by the whole team and there has to be a strong liaison within the team.
- The importance of case reviews to discuss progress and to set short-term goals for the following week is vital, in most units the client will attend and be part of the goal setting.
- Inclusion of all relevant individuals ensures that both the therapy team and the patient know the focus of the programme and to avoid what is termed in mental health 'splitting'.
- Splitting describes a technique of playing one person against another or suggesting to one professional that another professional is not doing their job properly.
- If a patient suggests this or makes a complaint or suggestion about the physiotherapist then best practice is to share this with all the team and to make a clear and detailed record of the comment or complaint.
- In this way the patient understands that there are no 'secrets' in the team and that they are part of that team.
- Always know what the route is for the patient to make a formal complaint.
- In most cases hospital will have a leaflet explaining this from their PALS team.

Goals

Short-term

- Bring the patient to some understanding and acceptance of their condition.
- Identify any physical causes of dysfunction.
- Strengthen weak muscles.
- Treat causes of pain.
- Achieve personal self-care activities.

Long-term

- Bring patient to full understanding and acceptance of their condition.
- Restore the person to the highest functioning level without the props of wheelchairs, sticks and dark glasses.

Methods

- Positive reinforcement of activities that they can partake in.
- Demonstrate evidence of musculoskeletal restriction and highlight areas where restriction cannot be evidenced.
- Recondition muscles.
- Provide a way of beginning to move.
- Initially this may be an easier option than recognising the psychological components of their illness, but the success is for the patient to be able to accept both parts of the disorder.

Reconditioning

- Sometimes when disability has been around for 20 years or more then there are more specific deconditoning factors that need physical approaches to correct.
- Strengthening regimes, activity programmes may be useful and the treatment is therefore a combined physical and psychological approach.
- The role of the occupational therapist is interwoven with that of the physiotherapist and is vital in transferring any gains in physical activities into more functional behaviours, regimes and returning the patient's skills to a premorbid level.
- A period of admission removes the individual from the environment and background that may have been a contributing cause or the catalyst for their difficulties.
- The following section provides a vignette of a patient with conversion disorder and the treatment that was given.
- Each patient will be different, but the general principles outlined can be followed for any patient.

The patient

Background

- A middle-aged lady who has been using a wheelchair for the last 10 years.
- She had had previously held a high-powered job, but her life was 'shattered' when she became aware that her husband might be having an affair.
- She had an episode of disability that was diagnosed inconclusively as a possible left-sided stroke.
- The relationship with her husband improved and she started to regain her previous level of mobility.
- One year later the husband admitted to an affair and he left to live with his new girlfriend.
- The lady suffered another episode of much greater severity and although having periods of therapy has remained in a wheelchair for the last 10 years.
- She has a supportive daughter who was 23 when the partners split.

The physiotherapy assessment findings

- Poor neck posture with evidence of a neck injury following a road traffic accident, which she reported to have happened 20 years ago.
- Weak gluteal musculature bilaterally, no neurological cause, possibly due to disuse.
- Disuse weakness of the whole of left side lower limbs and varied weakness of upper limb, with associated posturing on movement of the left arm.
- Poor rotator cuff stability bilaterally.
- Mobility was limited to a couple of steps when necessary in order to transfer.
- Able to independently self care.

Treatment plan

- Work initially on bed exercises to regain strength in core stability muscles.
- Address posture in all planes in lying, sitting and standing.
- Use of positioning in crook lying for stability, ensuring neck alignment and leg positioning. Pillows may be needed to allow leg to remain in good position initially.
- Use verbal and physical cues to encourage active movement in the left leg.
- Progression to gym work in lying, sitting and standing.
- Improve mobility of neck and upper thoracic area by application of mobilisations and connective tissue massage.
- Strengthening exercises in all positions for both sides of the body.
- Focus on establishing symmetry.
- Weight transference concentrating on good symmetrical alignment.
- Transferring into normal chairs.
- Talking when standing.

- Gradually increase walking distances.
- Talking when walking.
- Transfer core stability exercise to the standing position.

Summary

- Treatment was designed to enable the patient to take small steps and concentrate on developing a pattern of gradual increase in resistance and activity.
- The next steps involved the team working towards independence in society for the patient.
- The physiotherapist will be part of setting goals that involve the patient going out to the shops without her wheelchair and getting on public transport, or being part of a group of other people.
- The fear associated with being in public without the wheelchair, which has been a prop for years cannot be overestimated.
- The whole team will be part of the rehabilitation needed to achieve full return to her pre-morbid life.
- Ongoing interventions may include CBT, assertiveness training, anxiety management.
- The physiotherapist will be central to the provision of a home exercise programme and introducing the patient to the use of community gyms which will provide her with extra confidence in maintaining the physical gains that she has achieved during her period of treatment.

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Chapter 10

E-materials

Author profiles

Jackie Clifford MSc BA Cert. Management GradDipPhys MCSP

Jackie Clifford is a specialist physiotherapist in mental health working as a self-employed Rehabilitation Consultant, based in Worthing in West Sussex.

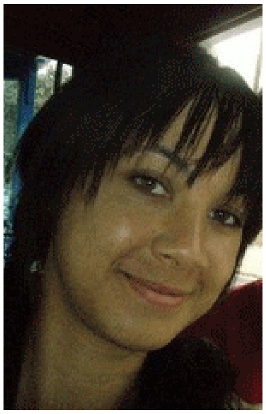
Jackie has been involved in mental health physiotherapy for over 20 years, and possesses extensive experience of working in acute adult and older adult mental health and in adult learning disabilities services.

Jackie has been an active committee member of national and regional physiotherapy professional networks (CPMH) for physiotherapists working in mental health; and responsible for establishing the regional physiotherapy professional network (CPMH) in London and the South East in 2004.

Jackie has also been involved in Chartered Society of Physiotherapy (CSP) steering groups and in (CSP) publications including guidelines for manual handling, UK information papers on mental capacity, research priorities group for mental health and well being, and a national strategy for the role of physiotherapy in mental health.

Kerry Gibson BSc(Hons) MCSP

Kerry Gibson is a physiotherapist working in Men's Forensics and Neuropsychiatry at Birmingham and Solihull Mental Health NHS Foundation Trust. Previously Kerry was working within acute services in mental health for the same Trust. Currently involved in the management of the clinical education of students, and liaising closely with local universities regarding the current physiotherapy course curriculum; Kerry has recently been appointed Education Lead for the CPMH Committee.



Caroline Griffiths GradDipPhys MCSP

Caroline has worked in various areas of Mental Health both in Primary and Tertiary settings over the last eleven years and is currently the Professional lead for Physiotherapy, Mental Health Division, at Oxford Health NHS Foundation Trust.

An educator in clinical and academic settings she has contributed to many published works on the role of Physiotherapy in Mental Health.

As Chair of Chartered Physiotherapists in Mental Health Caroline was part of the team which created the CSP / CPMH strategy for Mental Health.

Now vice chair and Professional Network representative Caroline sits on the Education Committee of the Chartered Society of Physiotherapy.

Venkat Narayanan MSc BSc(Hons) MCSP

Venkat Narayanan is a Senior Physiotherapy Practitioner working with older people in acute mental Health setting at Oxford Health NHS foundation Trust. Venkat has 11 years of Physiotherapy experience predominantly worked in Neurological Rehabilitation and older people care. He is currently involved in a research project funded by NIHR for evaluating falls prevention in acute inpatient mental health setting.

Appendix 10.1 Laura mitchell relaxation

Background

Laura Mitchell was a physiotherapist who worked in London in the 1960s. She used her knowledge of how muscle groups worked to devise this effective relaxation method.

Many muscles work in opposing pairs, for example the 'biceps' and 'triceps' muscles in your arm. When one contracts the other must relax. So when you bend your arm, your 'biceps' muscle contracts. To enable it to do so, your 'triceps' muscle (at the back of your arm) must relax. It has no choice! The following relaxation method is based on the simple principle of contracting certain muscles to encourage their opposites to relax.

Begin

Lie down in a comfortable position without crossing your legs. If you can't lie down for any reason you can still do this sitting up. Make sure you are comfortable with your arms and legs uncrossed, your feet flat on the floor, and your arms loosely resting at your sides with your hands gently resting on your lap or on the arms of the chair if it has some.

You can start at your feet and work up or start at the head and work down, it's up to you!

Breathing

Close your eyes and notice your breathing. Don't try to change it, just notice and let your attention softly focus on your breath, gently letting go of any other concerns for a short time and allowing yourself to rest here for a few moments.

Feet

Gently point your toes away from your body if you are lying down, or push your feet into the floor if sitting. (Stop if you experience cramp and bring your toes in the opposite direction towards your body.) Hold this position while you count to 5, and then relax. Notice how your muscles feel … and allow your muscles to rest in the position where they naturally return to.

Repeat.

Legs

Roll your knees apart a little way.

Hold while you count to 5 again, then relax.

Repeat.

Buttocks

Clench your buttocks.

Hold while you count to 5 again, then relax. Remember at each stage to notice how your muscles feel … and allow your muscles to rest in the position where they naturally return to.

Repeat.

Back/abdomen

If lying down, push the small of your back into the floor.

Hold while you count to 5 again, then relax.

Repeat.

If sitting: pull your abdominal muscles in and sit upright.

Stress-reduction resources from Ruth Hadikin Associates: Supporting Stressed Out Professionals!

Hold while you count to 5 again, then relax.

Repeat.

Shoulders

Pull your shoulders down, away from your head, and slightly back.

Hold for a count of 5, then release.

Repeat.

Elbows

Move your elbows slightly away from your sides. Hold for a count of 5, then relax.

Repeat.

Hands

Stretch your fingers to make them long, hold for a count of 5, then release.

Repeat.

Eyebrows

Raise your eyebrows as though surprised. Hold for a count of 5, then release.

Repeat.

Jaw

- Keeping your mouth closed slowly stretch your lower jaw downwards.
- Hold for a count of 5, then release.
- Repeat.
- Allow yourself to relax. Notice how your body feels.
- Notice your breathing.
- Imagine you are somewhere that is peaceful for you ...
- imagine the sights ... sounds ... smells ...
- Allow yourself to rest here a while.
- When you are ready, slowly bring yourself back to the present moment. Get up slowly.
- Once you have learned the technique you can adapt it and do those parts that are more suitable for you.
- For example the shoulder relaxation is helpful even if you are at work, especially if your work involves sitting at a computer for long periods.
- It is always beneficial to go through the whole routine at least once a day, so your muscles remember the process of letting go and release, and your body doesn't hold on to tension.

Taken from Dreamcoach, © 1999–2011 Ruth Hadikin Associates, with permission. http://www.dreamcoach.co.uk/LauraMitchell.htm

Case Study 10.1

Background

- Mary, 72 years old, female diagnosed with psychotic depression.
- She has a medical history of Parkinson's disease with frequent falls.
- Her mental health has declined since her husband died a few years ago.

History of present condition

- Mary was admitted to the acute mental health inpatient setting for her current episode of psychotic depression.
- She has had many recent falls.
- She referred for physiotherapy for falls prevention, management of her Parkinson's disease and to improve her physical and mental wellbeing.

Assessment

Psychological and social

- Mary was particularly withdrawn and declined to participate in activities.
- She cited a lack of energy as the main reason for her non-participation.
- She refused to engage in conversation with staff and other clients.

Physical

- Reduced facial expressions, poor eye blink, with a general look about her that displayed sadness and a depressed outlook.
- Poor posture, with tendency to have flexed hips and knees.
- Bradykinesia particularly in her lower limbs.
- Freezing, this was spasmodic and very much on or off.
- Freezing often occurred when Mary experienced panic attacks.
- Festinating gait.
- Dysarthria, speech was poorly articulated (hypokinetic).

- General weakness of all muscle groups and poor endurance, which was considered to be a result of her reduced participation in exercise and activities.

Baseline assessment

- EMS (Elderly Mobility Scale) produced a score of 4/20 which indicates she is dependent on ADL.
- STRATIFY (Falls Risk) Mary scored 3, which indicated that Mary was a high risk for falls.

Treatment planning

Key aims

- Facilitation of safe discharge, promote independence and quality of life.
- Falls prevention.
- Promote her mental and physical wellbeing through physical activities, e.g. group and one-to-one exercises.
- Manage her Parkinson's symptoms through evidence-based treatment approaches.
- Improve her physical strength and endurance through progressive graded strengthening exercises.

Short-term goals

- Improve therapeutic engagement.
- Reduce the risk of falls.
- Improve gait, balance and physical strength.
- Increase client participation and socialisation.
- Increase awareness of falls risk and prevention.

Long-term goals

- Improve mobility level to borderline capacity, e.g. to achieve 10/20 in EMS from dependent state.
- Improve confidence of balance to use stairs when she is discharged from hospital.
- Enable Mary to attend a gym and exercise group in the community after her discharge.

Analysis/clinical reasoning

- Her balance and mobility problems were not thought to be entirely due to Parkinson's disease.
- There was a possibility that the problems were due to her long-term use of anti-psychotics.
- Differential diagnoses – the following conditions had all been excluded: vascular Parkinsonism, progressive supranuclear palsy, Alzheimer's disease with dementia.
- Moreover her mobility seemed to be improving significantly after her ECT (electroconvulsive therapy).
- The consensus opinion was that her mood and behaviour had a considerable effect on her balance and gait.
- Therefore Mary was included in group activities such as Tai Chi, Tea Dance, and she was included in the exercise group to improve her mental and physical wellbeing and one-to-one physiotherapy exercise sessions were given to improve balance, posture and gait.

Treatment

- 'OTAGO' falls prevention exercises to improve balance and strength.
- Submaximal graded strengthening and physical activities in the gym for 20–30 minutes, including use of equipment such as a reclining bicycle and treadmill.
- Auditory cueing techniques using a metronome, to reduce freezing and festinating gait problems.
- Tai Chi in sitting, to improve relaxation, posture and strength.
- Tea dance and exercise group, to improve mood, socialisation, movement and balance.

Outcomes of physiotherapy intervention

- Client EMS scores improved from 4 to 12/20.
- Mary's participation in group activities become consistent, which improved her mood and socialisation.
- Gait: Improved with auditory cueing technique in terms of stride length, reduction of freezing and festinating gait.
- Mary was able to negotiate a flight of stairs without experiencing fear of falling or loss of balance.

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Case Study 10.2

Background

- 50-year-old lady presented with long-term clinical depression, self-neglect, suicidal tendencies.
- She was a heavy cigarette smoker, with chronic obstructive airways disease.
- After a recent discharge from in-patient acute mental health unit had moved into an inner city hostel, following a period of homelessness prior to hospital admission.
- A physiotherapy referral was made to assist the client with mental and physical health and well-being, exercise tolerance, mobility and functional activity, and self-management of breathing, including relaxation techniques.

Assessment findings

- Respiratory distress and breathlessness at rest, after walking short distances.
- Restricted mobility and functional activity due to shortness of breath.
- Low mood, signs of clinical depression, low self-esteem and evidence of self-neglect.
- Difficulty engaging socially with people.
- Restricted mobility of thoracic and cervical spines and both shoulders.
- General weakness of all muscle groups in both upper and lower limbs.
- Poor exercise tolerance.

Treatment aims

- Maintain and improve self-management of her breathing patterns.
- Maintain and improve mobility and functional activities, e.g. walking.
- Maintain and improve mood, self-esteem, self-care and mental and physical health and well-being.
- Encourage engagement with people and community activities.
- Maintain and improve mobility of her spine and shoulders.
- Maintain and improve general muscle strength and exercise tolerance.

Short-term goals

- To engage with day centre activities programme and physiotherapy service by 4 weeks.
- To increase ability to relax and move gently whilst managing her breathing pattern, within 4 weeks.
- To increase body awareness and ability to move efficiently, within 4 weeks.

Long-term goals

- To be able to engage with community activities, within 8 weeks.
- To improve self-esteem, self-care, mental and physical health and well-being, within 8 weeks.
- To establish an individual exercise programme in order to improve posture, mobility of the spine and shoulders within 8 weeks.
- To establish an individual exercise programme to maintain and improve general strength and exercise tolerance in all muscle groups in the upper and lower limbs, within 8 weeks.

Physiotherapy programme

- Treatment included the following:
  - Individual Tai Chi based exercise programme, in sitting and standing as able, to encourage relaxation, body awareness and gentle movements of the upper and lower limbs
  - Posture awareness and breathing control
  - Exercise programme including; shoulder girdle movements; spinal movements; head control; upper and lower limb mobility and strengthening exercises, e.g. throwing and catching balls at different speeds and over different distances
  - Individual advice and practice for posture awareness, relaxation and breathing control. This included diaphragmatic breathing in sitting, standing, and walking; and appropriate rest positions to assist in breathing control
  - Functional activities including sitting to standing, at different speeds and increasing number of repetitions as the client's breathing pattern and exercise tolerance improved
  - Walking practice, including turning, standing and walking posture, walking different distances and at different speeds depending on client's breathing pattern and exercise tolerance
  - Group exercise programmes including group Tai Chi exercise sessions
  - A home exercise programme, and encouragement to engage in community activities. Client was advised on self-management in home activities based on her breathing pattern and exercise tolerance
  - Time allocation and progression in each physiotherapy session was dependent on the improvement gained from previous interventions and the client's breathing

pattern and exercise tolerance on attendance.

Clinical reasoning and evidence

- The physiotherapy interventions and rehabilitation provided to the patient were supported by the evidence base (Everett et al 2003, CSP 2010, NICE 2010).

Outcomes

- Physiotherapy aims and treatment goals successfully met as follows:
  - Client successfully engaged with her physiotherapy programme
  - Client increased her ability to undertake her exercise programme in the physiotherapy department and at home
  - Client increased her awareness of and self-management of breathing control, breathing pattern, rest positions and relaxation
  - Client maintained and improved her mobility and strength in the upper and lower limbs and developed an increased postural awareness
  - Client increased her ability to undertake functional activities in walking, and engagement in community activities, including joining coach trips to places of interest
  - Client maintained and increased her self-esteem and mood
  - She became more engaged in her self-care and showed good evidence of improved mental health and well-being.

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Case Study 10.3

Background

- Miss J, 24-year-old female.
- Medical student, final year.
- She was informally admitted to the eating disorder in patient unit.
- Miss J had been managed for the past 5 years by day services who had referred her to the eating disorder unit.
- Her GP had diagnosed depression linked with anorexia.

Subjective history

- Miss J reported that her eating disorder began approximately 8 years ago.
- She says that she has been admitted to in-patient services as a result of being on an elective medical placement which meant she had increasingly less contact with day services.
- As a result there had been a deterioration in both weight and her mental state.
- Miss J previously presented with suicidal ideation, but denies any at present.
- She had a history of self harm, i.e. pinching and scratching herself.

Past medical history

- Hypokalaemia.
- Severe nut allergy.

Relevant family medical history

- Aunt diagnosed with bulimia.
- Grandfather diagnosed with dementia.

Social history

- Miss J was bullied at primary and secondary school, and states she was a 'pushover'.
- Miss J often makes references to having low self-worth and finds talking about calorie counting and the subject of weight loss very difficult.
- She was currently living in a student hall of residence and had 2 weeks of her medical degree remaining.
- On discharge she will be returning home to live with her parents.
- Miss J talks about one past relationship which lasted for 3 years, ending approximately 1 year ago, which she says was dysfunctional and in which she was subjected to psychological, physical and sexual abuse.

Assessment

- Miss J complained of a dull ache, felt globally, VAS 7/10, which was aggravated by movement and weight bearing.
- She had full functional range of movement globally.
- Muscle strength in lower limbs was 4/5 Oxford Scale.
- Miss J was very inquisitive about physical exercise tolerance and weight gain in relation to exercise.

ADL, restrictions identified at assessment

- Pain was felt during all ADL.
- She had difficulty walking for more than 10 minutes at a time.

Treatment aims

- Education about why Miss J was experiencing pain.
- Education on the benefits of exercises, how to exercise safely and implications of hypokalaemia.
- Education on how to balance the aims of nursing staff to achieve a weight gain of 0.6 kg per week and carrying out exercise appropriately.
- Working closely with the nursing staff and informing them of progress made and clarification on points where physiotherapy treatment objectives may clash.

Treatment plan

- Global exercise programme targeting all muscle groups, to be carried out twice per week while Ms J is an inpatient.
- Each session to be supervised to ensure that technique used is correct.

Short-term goals

- Reduce pain to 4/10 VAS in 12 weeks.
- To be able to tolerate walking for 30 minutes.
- Miss J to demonstrate understanding about the purpose of exercise and to be able to carry out and increase intensity of exercise in a controlled manner.

Long-term goals for the treatment as a

whole

- To be pain-free and able to carry out all functional activities.

Chapter 10 Mental health multiple choice questions

1. What is the prevalence of mental health disorders in the UK?
   - a). 1 in 1000
   - b). 3 in 1000
   - c). 1 in 4
   - d). 10 in 3000
2. Which of the following is a psychotic disorder?
   - a). Depression
   - b). Eating disorder
   - c). Parkinson's
   - d). Schizophrenia
3. Electroconvulsive therapy is used to treat ...?
   - a). Mild depression
   - b). Medication-resistant depression
   - c). Eating disorder
   - d). Dementia
4. Which of the following is not a form of dementia?
   - a). Alzheimer's
   - b). Vascular
   - c). Lewy body
   - d). Huntingdon's chorea
5. When should the physiotherapist ignore verbal aggression from a patient?
   - a). Never
   - b). When the patient is psychotic
   - c). Always
   - d). When the patient is depressed
6. Imaginative journey relaxation techniques should not be used for patients with ...?
   - a). Depression
   - b). Anxiety disorders
   - c). Delusions
   - d). Early-onset dementia
7. Which of the following is a side effect of a typical antipsychotic medication?
   - a). Tardive dyskinesia
   - b). Rigidity
   - c). Restlessness
   - d). All of the above
8. What is OTAGO?

a). A mental health disorder
b). An antidepressant
c). An exercise programme
d). A massage technique

9. What is the most common reason for absence from non-manual work in UK?
a). Anxiety/stress-related disorders
b). Common cold
c). Back pain
d). Depression

10. Which of the following is not a method of falls prevention?
a). Dance
b). Supported sitting
c). Tai Chi
d). Core stability programme

11. Which of the following is not a useful communication method in dementia?
a). Loud repetition of instruction by more than one person
b). Touch
c). Use of familiar phrases
d). Single instruction

12. The Mental Health Act 2007 ...
a). States how and for how long a person can be detained in hospital
b). Gives relatives the power to have a relative detained in hospital
c). Describes mental health medications
d). Is part of a play about mental health

13. The term used for detaining a person under the Mental Health Act is ...?
a). Detention
b). Putting away
c). Sectioning
d). Incarcerating

14. CMHT stands for?
a). Common mental health treatment
b). Community mental health team
c). Community mobility home treatment
d). Care in mental health treatment

15. The most effective treatment for mild depression is ...?
a). CBT
b). Medication
c). Activity and regular directed exercise
d). ECT

16. Which of the following is the major side effect of an atypical antipsychotic medication?
a). Gain
b). Hair loss

c). Headaches

d). Restlessness

17. Which of the following is not an advantage of multigym use in mental health?
    a). Easily measurable progress
    b). Can be used as an element of assessment for cognitive processing
    c). Body building
    d). Clear setting of exercise boundaries
18. Physiotherapists use which of the following treatment/s for anxiety?
    a). Medication
    b). Relaxation
    c). Cognitive behavioural therapy
    d). Ultrasound
19. What body mass index (BMI) level is recommended before moderate exercise in eating disorder rehabilitation?
    a). Above 7
    b). Above 10
    c). Below 15
    d). Above 18.5
20. Which of the following is an antidepressant?
    a). Risperidone (Risperdal)
    b). Olanzapine (Zyprexa)
    c). Quetiapine (Seroquel)
    d). Citalopram (Celexa)

Mental health multiple choice answers

1. c)
2. d)
3. b)
4. d)
5. a)
6. c)
7. d)
8. c)
9. a)
10. b)
11. a)
12. a)
13. c)
14. b)
15. c)
16. a)
17. c)

18. b)
19. b)
20. d)

Chapter 11

Obstetrics and Gynaecology

Postoperative major surgery – treatment

Respiratory care

- Upper abdominal surgery is known to cause severe and prolonged alterations in pulmonary mechanics.
- Opiates and sedatives can also affect the natural 'sigh' mechanism (Richardson and Sabanathan 1997).
- Respiratory physiotherapy is essential to prevent the development of atelectasis and chest infections.
- Active cycle of breathing techniques with supported huff/cough should be taught, and incentive spirometry provided for those at most risk.
- Active treatment should be undertaken when pain relief is most effective and independent work encouraged.
- For patients who develop respiratory complications, oxygen therapy, humidification and nebulisers may be necessary.
- Positive pressure devices, such as CPAP, can aid lung expansion (Cook 2004).

Initial bed activity exercises

- When an epidural is in situ, the presence of equal, bilateral lower limb sensation and general mobility must be assessed.
- Simple active ankle and knee exercises should be encouraged; gentle pelvic rocking/knee rolling may help relieve flatulence (Cook 2004).

Initial transfers

- Patients should be taught how to move in bed, e.g. from lying to sitting via side-lying to minimise intra-abdominal pressure; moving up the bed by bending their knees and using their thigh muscles, digging in with their heels, pushing up with their hands and straightening their knees so that the hips lift up off the bed and back towards the pillow (Cook 2004).
- The occupational therapist (OT) may need to assess regarding any assistive equipment

and techniques, e.g. a bed-lever may be supplied to aid general bed mobility.

Positioning

- Supported resting positions such as half lying with a pillow under their thighs and side lying with pillows between the knees and under the lower abdomen may be beneficial.

Posture

- Good posture in standing and supported positions in sitting, using appropriately placed pillows or lumbar rolls, may also help to reduce backache in the postoperative period.
- Patients may benefit from a recliner chair or specialist pressure relief; a graded sitting tolerance programme should be instigated for the most severely debilitated (Reed and Sanderson 1992).

Mobility

- Early ambulation should be encouraged.
- On day one, the patient should be assessed regarding ability to transfer out to a chair, including the potential use of a hoist.
- Standing should be encouraged and the need for a walking aid assessed.
- By day two most patients should be able to walk, with the assistance of two, for a short distance and progressed to independent mobilisation as able (Cook 2004).
- Less extensive or laparoscopic surgery would require similar multidisciplinary team (MDT) input, although progress is usually quicker.

Postoperative complications

- Tumour-related complications can include:
  - Renal failure due to bilateral ureteric obstruction
  - Acute haemorrhage from tumour occasionally resulting in hypoglycaemic shock
  - Fistulae between vagina and bladder or rectum
  - Pyometra (pus in the urine cavity) due to obstruction of cervical canal by tumour (Hatch and Berek 2005).
- Immediate postoperative complications can include:
  - Bleeding (internal), deep venous thrombosis, respiratory problems, paralytic ileus, urinary tract and wound infection (O'Connor 1998, Sharpe 1998, Cook 2004)
  - Lower limb, lower abdominal or groin lymphoedema may also develop in those who have had pelvic or groin node dissection
  - Bladder and bowel dysfunction are common in the immediate postoperative period;

suprapubic or urethral catheterisation and laxatives are therefore desirable in the first week

– It is essential to monitor the patient's ability to void after removal of the catheter, a functional assessment may be required regarding access to and transfers on/off the toilet, rearranging clothing and cleaning of the perianal area and hands (Reed and Sanderson 1992) alongside adequate control of bladder and bowel.

Physiotherapy management in the convalescent/post-acute phase

Counselling/information provision

- This may be an anxious time for the patient as they await pathology results.
- Gynaecological cancers have profound psychosocial implications in addition to the obvious physical manifestations. Women are confronted with cancer and its related treatments, which may impact adversely on body image, sexuality and relationships, including the possibility of imposed infertility and/or menopause.
- Altered body image is an important factor and becomes problematic when it affects the individual's quality of life (Shearsmith-Farthing 2001).
- It is important that appropriate, timely and confidential information is provided.
- Literature and websites sponsored by cancer charities are useful; some details are supplied at the end of the chapter.
- Eighty per cent of centres now offer aromatherapy for the relief of stress and anxiety (Kohn 2003).
- Menopausal symptoms may begin quite quickly after Bilateral salpingoophrectomy (BSO); advice on the control of symptoms should be provided by the consultant surgeon/oncologist; HRT can be contraindicated in some cancers (Biglia et al 2006).

Rehabilitation (including pelvic muscle floor retraining)

- Pelvic tilting, knee rolling, abdominal bracing and knee bends may be taught as exercises for the lower abdominal muscles and lower back.
- Expert opinion also suggests that pelvic floor muscle training after gynaecological surgery may mitigate problems such as urinary incontinence both in the short and long term (Cook 2004).
- Many physiotherapists delay instruction until the catheter is removed, although there is no evidence of harmful effects resulting from undertaking pelvic floor exercises whilst a

urinary catheter is in situ (Haslam and Pomfret 2002).

- Ideally these exercises should have been taught preoperatively, however in both scenarios a vaginal assessment is unlikely to be possible.
- Therefore, the use of diagrams and models to verbally describe the anatomy and function of these muscles is essential as many women find it difficult to achieve correct pelvic floor contraction on verbal instruction alone (Bø et al 1988, Bump et al 1991).
- A combination of fast, slow and anticipatory pelvic floor muscle contraction should be taught to prevent leakage and control urgency.
- Patients may present with bladder problems ranging from hesitancy and poor flow, to incontinence, frequency and urgency, which may or may not have been present before surgery and/or related to the underlying malignancy.
- Individualised advice is required as this can be difficult to manage.
- Cranberry juice may be recommended to help prevent urinary tract infections, although this is contraindicated for patients on warfarin (Jepson et al 2004, Aston et al 2006).

Constipation management

- Some patients may also develop constipation, therefore education regarding correct diet and defecation position and technique should be taught.
- This includes sitting with the knees apart and higher than the hip joints; this may require the feet to be on a support.
- The trunk should be flexed forward at the hips supported on the forearms, and with the neutral spinal curves maintained.
- A bracing technique should be adopted which means to make the waist wide and to let the abdominals bulge anteriorly (Chiarelli and Markwell 1992, Markwell and Sapsford 1995).
- Straining should be avoided.
- The use of a pad to support the perineal area may be useful.

Diet

- Dietary advice can be helpful including information on supplementary feeding for those with depressed appetite and for those with stomas.

Ascites

- Ascites (the presence of fluid in the abdomen) may sometimes be present before surgery or in the later stages of the disease.
- This makes deep breathing and expansion of the bases of the lung difficult; patients should be encouraged to breathe as deeply as possible, and provided with oxygen therapy if appropriate.

- Ascites can also affect functional activities because range of movement can be restricted and tolerance reduced.
- Some relief may be gained from paracentesis (Krishnan et al 2001).

Activities of daily living (ADL)

- Following assessment and advice, the provision of ADL equipment can promote independence in personal care, toileting, bathing, transfers, seating and pressure relief.
- Written and verbal advice on a graded return to domestic, social and work activities are also essential.

Discharge preparation

- Before discharge, patients with stairs at home should have a supervised trial.
- If required ADL reports should be completed and adequate home-care provision organised by liaison between the hospital and community or social services.
- District nursing services to assist with the management of continence/wound/stoma and input from the community MDT to assess, facilitate and encourage mobility and independent activities are often required.
- For some, nursing home or respite care is needed, and input from voluntary sectors, such as a hospice, Marie Curie or Macmillan, can also be essential for palliative support.

Minor surgery

- Examples of minor surgery are laparoscopic hysterectomy, vaginal hysterectomy, prolapse repair, Trans vaginal tape (TVT).
- Following such surgery advice on pelvic floor muscle exercises and return to ADL should be provided.
- Additional information for those returning to high-impact sport can also be provided.
- Sources of information: Association of Chartered Physiotherapists in Women's Health (ACPWH) leaflet Fit for Life, Royal College of Gynaecologists (RCOG).

Prostate surgery

- In some settings the WH physiotherapist may visit men who are going to have or have recently undergone either a radical prostatectomy or a transurethral resection of prostate (TURP).
- There is some evidence that suggests that pelvic floor muscle training helps prevent or restore continence.

- To undertake a pelvic floor muscle (PFM) contraction the men should be advised to contract around the back passage, bring this feeling to the front with a scrotal lift and should be held for as long as possible (Dorey 2006).

Pelvic floor dysfunction (outpatients)

- Pelvic floor dysfunction encompasses the problems of genital prolapse, urinary and faecal incontinence, voiding dysfunction, and discoordination spasm of the muscles of the PF.
- These conditions may occur alone or in combination with one another.

Continence

- Continence problems occur in many patients especially as they get older, although it is not an inevitable part of ageing, or can be associated with conditions such as stroke, multiple sclerosis, diabetes or post-partum.
- When undertaking general rehabilitation, either as an inpatient or as an outpatient, it is often good practice to remember that patients may need to go to the toilet more often and quickly than usual.
- Multidisciplinary input is invaluable for such patients as functional problems of access, appropriate clothing and recognition of toilet area often helps.
- During a rotation in Women's Health, patients with pelvic floor dysfunction are assessed and advised as outpatients and can be referred by a GP, gynaecologist, urogynaecologist, obstetrician, midwife, urologist, neurologist, allied health professionals and in some areas by self-referral.

Pelvic pain

- Explain the rationale for proposed treatment modalities.
- Interventions that may be applied may include cognitive–behavioural therapy, PFM relaxation and re-education exercises, manual therapy, adjunctive therapies and pain management.
- Direct treatment to the presenting symptoms and address objective findings.
- If there is no response to treatment within a reasonable timeframe (allow 3–4 months) refer the patient for either psychosocial evaluation or pain management.
- This is a complex specialist area of treatment (Frawley and Bower 2007, Knight and Shelly 2008).

Urinary incontinence

- Following assessment it is important to teach the patient about the PFM and lower urinary tract function using diagrams, drawings and models.
- Explain a correct PFM contraction and if the woman consents vaginally assess PFM contraction.
- If active contraction is possible agree an individual training programme to be conducted at home.
- If strengthening is the main goal then the main factors to be considered are the same as for any muscle, i.e. overload, specificity, maintenance and reversibility.
- For patients with SUI recommendations are for women to exercise performing a minimum of 8 contractions 3 times a day, with training lasting for 3 months (NICE 2006).
- Ask the patient to suggest where and when exercises should be performed.
- Supply an exercise diary or 'biofeedback back' with computerised adherence registration.
- If the patient is unable to contract the muscles, try manual techniques such as touch, tapping, massage, fast stretch or using biofeedback, e.g. electromyography biofeedback, perineometry, ultrasound or electrical stimulation.
- In addition to a strength training regimen ask the patient to precontract and hold the contraction before and during coughing, laughing, sneezing and lifting (conscious precontraction, the 'knack').
- Follow-up with supervised training, weekly or more often.

Electrical stimulation (ES)

- Transcutaneous electrical stimulation (ES) is most frequently administrated using vaginal or anal plug electrodes, or percutaneous electrical stimulation, e.g. posterior tibial nerve stimulation.
- ES for Stress urinary incontinence (SUI) is focussed on improvement of the urethral closure pressure and sphincter activation, or as a kind of feedback procedure in patients who are unaware of how to contract the PFM and are unable to do so voluntarily.
- Office-based equipment as well as portable electrical stimulation devices have been developed.
- There is a lack of consistency in the ES protocols used in practice.
- The most common protocol uses a frequency of 10 Hz, pulse duration of 250 ms, and duty cycle of 1 : 2, although frequency and duration of application tend to be varied.

Biofeedback

- Biofeedback is defined as 'the technique by which information about a normally unconscious physiological process is presented to the patient and/or therapist as visual, auditory or tactile signal'.
- By using biofeedback it raises awareness of PFM activity and improves compliance to

exercise.

- The main biofeedback tools are:
  - Digital vaginal palpation, the therapist provides 'verbal biofeedback' about PFM contraction
  - Digital self palpation
  - Hand-held mirror
  - Educator™
  - Vaginal cones
  - Manometry
  - Electromography
  - Real time ultrasound
  - Dynamometry.
- Patients who undergo a vaginal assessment receive verbal feedback on correct technique of PFM contraction and the use of further biofeedback techniques depends on patient, clinician and availability.
- Biofeedback can also be used to teach PFM relaxation.

Advanced manual therapy

- On vaginal examination areas of reduced or nil PFM activity or areas of increased or overactive muscle fibres are often detected during a voluntary contraction.
- Manual therapy techniques such as trigger point release can be used in a patient where such muscle imbalance exists and is indicated for defecation dysfunction, Over active pelvic floor (OAPF) and urinary incontinence.
- Following such treatment in order to maintain the resting length of the muscle the patient must learn how to exercise it and a self-help technique called 'sniff, flop and drop' has been found to be beneficial (Whelan 2008).
- Once this technique has been established the patient can progress to an exercise programme of contracting the transversus abdominis, then the pelvic floor muscles holding these contractions while breathing in and out.
- A home exercise programme can then be developed.

Pelvic floor stability and trunk muscle co-activation

- As with any muscle the PFM do not work in isolation, but there is debate as to the benefit of actively co-contracting transversus abdominis (TrA).
- There is evidence that a co-contraction of the TrA occurs during PFM contraction and that a co-contraction of the PFM during TrA contraction may be lost or weakened in patients with symptoms of pelvic floor dysfunction (Bø et al 2009).

Bladder training and behavioural training

- Components of behavioural treatment can include:
  - Introduction of voiding schedules
  - Bladder control strategies
  - Urge suppression techniques
  - Urethral occlusion
  - Biofeedback
  - Self-monitoring with a bladder diary
  - Behavioural lifestyle changes such as weight loss
  - Fluid and diet management.
- These strategies are useful both for urge and stress urinary incontinence and can achieve significant improvements in continence in some patients.
- Self efficacy and motivation play a large part in their successful use.

Mixed urinary incontinence

- PFMT is recommended as a first line of treatment for stress and mixed UI in women.

Urge urinary incontinence

- It has been shown that PFMs play a role in overactive bladder and urge incontinence in women as well as men.
- Voluntary contraction of the PFMs not only can occlude the urethra, but also can inhibit or abort detrusor contractions.
- This is a skill that can be accomplished by most patients and provides significant reduction of incontinence.
- The first step in behavioural training is to help patients to identify their PFMs and to contract and relax them selectively without increasing pressure on the bladder or pelvic floor.

Medications

- There are several medications that can be prescribed to the patient with urgency or urge incontinence.
- These are mainly anticholinergic agents which abolish or try to reduce the severity of detrusor muscle contraction.
- Side effects such as dry mouth or eyes or constipation sometimes occur.
- At present there is one medication which may be prescribed for SUI (Duloxetine

hydrochloride), and one for nocturia (Desmopressin).
- Intravesical Botulinum toxin A is emerging as a useful alternative in neurogenic detrusor activity.
- It is important to remember that drug treatment should be part of a behavioural package and that fluid management, drill and pelvic floor re-education remain the cornerstones of conservative management.

Bowel dysfunction

Faecal incontinence (FI)

- Principles are to keep the stool formed and keep the rectum empty.
- Stool consistency can be altered either by dietary manipulation or by use of constipation agents or both.
- It is important to recognise that the introduction of a high-fibre diet or fibre supplements in the diet can be used to soften the stool as well as to make it formed.
- This can be achieved by regulating the amount of oral fluids.
- If the stool is already liquid then the introduction of fibre supplements with limited oral fluids makes the stool firm as the fibre draws fluid from the stool itself.
- Constipating agents that work by slowing intestinal and colonic motility are also beneficial.
- The most common agents are codeine phosphate and loperamide.
- These agents increase the residue time for the stool in the colon and therefore provide a better opportunity for absorption of water from the stool.
- Keeping the rectum empty is important, particularly in the elderly patient who often has faecal loading or impaction.
- In these patients FI is secondary to the faecal impaction and often the treatment of the faecal impaction results in complete resolution of the symptom of FI.
- The simplest way of keeping the rectum empty is by regular use of glycerine suppositories and occasionally daily enemas or washouts are necessary.
- Establishing a regular complete rectal evacuation at a predictable time may be beneficial.
- Dietary management of FI or urgency is difficult to control as it is difficult to predict in different patients.
- Clinically a lot of patients derive benefit from moderating their fibre intake.
- Incontinence of flatus is difficult to control, products such as probiotics and aloe vera are reported as helpful in reducing flatus by some patients.
- Quantity and type of fluid is important.
- Alcohol seems to cause the bowels to be loose in some people and some have a bowel that is very sensitive to caffeine (Norton 2007).

Exercise

- There is little evidence to support the use of PFM exercises for FI, except for the early post-partum period following a third-degree tear.

Biofeedback

- This attempts to teach the patient to alter rectal sensitivity and to respond to the normal decrease in anal pressure then the rectum is distended (rectoanal inhibitory reflex) by a voluntary squeeze to avoid incontinence.

Electrical stimulation

- Intra-anal electrical stimulation has been reported to be a useful adjunct to exercises or biofeedback with some suggestion of improved effect.

Constipation

- Conservative measures include dietary manipulation, judicious use of laxatives and specific drug therapy.
- Once a mechanical cause for constipation has been ruled out all patients should be given advice regarding a high-fibre diet, fibre supplementation and increased oral fluid intake prior to rectal and colonic transit studies.
- Increase in exercise in sedentary patient, improving poor toilet facilities, providing privacy can improve the status.
- Defecation techniques can be taught (Chiarelli 2008).

Abdominal massage for constipation

- Abdominal massage for the relief of constipation was taught for many years in physiotherapy schools but its use went out of fashion in the 1960s.
- However, it has regained popularity with some evidence of effectiveness in people with chronic constipation and/or faecal incontinence when used as part of a holistic bowel management strategy.
- The massage is applied in a clockwise direction and has four basic strokes, stroking, effleurage, kneading and vibration.
- Daily massage lasting for approximately 15 minutes is usually recommended and it may take up to 3 weeks to show effect.
- There are no known adverse effects and is thought to have a mechanical and a reflex effect on the gut, thus encouraging peristalsis and may also utilise the mass movement of

the gut increasing the strength of the contraction.
- Thus massage may reduce gastrointestinal transit time, soften stool and load the rectum (Emly 2008, McClurg et al 2010).

Laxatives

- Laxatives should not be used as a first line of treatment for constipation and the choice of agent largely depends on presenting symptoms, nature of complaint, patient acceptance and compliance.
- There are four main groups of laxatives:
  - Bulking agents
  - Stimulants
  - Osmotic preparations
  - Faecal softeners and rectal preparations (Irwin, 2008).

Obstetrics

Outpatient group work

Back care classes/pelvic girdle pain classes

- Some WH services will provide an 'early-bird' class with the aim of promoting good health in pregnancy.
- Others will provide a back care class or pelvic girdle pain class specifically for people who have developed musculoskeletal problems.
- For some women with early aches and pains, advice and exercise may provide relief or resolution of their problems.
- Women who require 'hands-on' treatment will find all the information given in such a class of benefit too.
- Classes may include some or all of the following:
  - An overview of the physiological and musculoskeletal changes in pregnancy
  - Posture correction and back care advice
  - Comfortable positions to sleep and correct ways to get in and out of bed
  - Advice about choosing baby equipment such as prams, baths, baby slings. It is imperative that the physiotherapist has a good understanding of products on the market and can analyse them from an ergonomic perspective and advise appropriately
  - Exercise which relieves discomfort in pregnancy should include pelvic tilting in sitting, standing and 4-point kneeling; transversus abdominus exercises in different functional positions; Thoracic spine mobilisation exercises (rotations, extensions

and side flexions)
  - Information about common ailments such as carpel tunnel syndrome, varicose veins, rectus-abdominus divarication, ankle swelling, etc. and how to relieve them
  - Advice on safe exercising in pregnancy (ACOG 2002; www.acog.org)
- Relaxation techniques – the Laura Mitchell method of relaxation is often used by women's health physiotherapists.

Antenatal exercise classes

- Exercise classes may be provided in the antenatal period.
- There are many benefits of exercise in the antenatal period, for example women are thought to sleep better, have improved posture, have increased strength and stamina to cope with the changes of pregnancy and the process of labour.
- It is also logical to think that women who maintain a level of exercise through pregnancy will return to their pre pregnancy weight in the postnatal period.
- Women can be taught safe cardiovascular exercise and core stability or Pilates style exercises in a safe environment by a physiotherapist who understands the increasing musculoskeletal demands on their body.
- Women should be screened prior to entry into a class.
- It is advisable to exclude those with the following:
  - Haemodynamically significant heart disease
  - Restrictive lung disease
  - Incompetent cervix/cerclage
  - Multiple gestation at risk of premature labour
  - Persistent second or third trimester bleeding
  - Placenta praevia after 28 weeks of gestation
  - Premature labour during current pregnancy
  - Ruptured membranes
  - Pre-eclampsia/pregnancy-induced hypertension (ACOG 2002).
- Relative contraindications are:
  - Heart problems, high blood pressure/hypertension, or maternal cardio arrhythmia
  - Anaemia
  - Asthma, chronic bronchitis or lung problems
  - Diabetes
  - Thyroid problems
  - Seizures
  - Extremely over- or underweight
  - Muscle or joint problems
  - History of spontaneous miscarriages
  - History of previous premature labours
  - Carrying multiples (e.g. twins, triplets)
  - A previously sedentary lifestyle

– Smoking (BabyFit recommends immediate cessation of smoking during pregnancy)
– Orthopaedic limitations
– Intrauterine growth restriction in current pregnancy (ACOG 2002).

Aquanatal classes

- Aquanatal classes involve pregnant and sometimes postnatal women exercising in the medium of water.
- The benefits of exercise in water are well documented and include reduced risk of injury to joints, little or no muscle soreness post-exercise and the hydrostatic pressure of water may reduce oedema.
- Pregnant women who have pain when mobilising will see particular benefit from the water as they will feel significantly lighter in the water and walking should be less painful.
- There are particular considerations and contraindications to aquanatal exercise.
- Further information can be found on the ACPWH website and in Chapter 3 in this volume (http://acpwh.csp.org.uk/publications/aquanatal-guidelines-guidance-antenatal-postnatal-exercises-water).

Parent education classes

- It is usual for midwives to lead a set of four to six parent-education classes for pregnant mothers and fathers.
- Physiotherapists may lead one or two or provide standalone classes.
- The aim of parent-education classes is to provide education, thereby improving knowledge and consequently enabling informed decision making.
- Some classes will be designed for specific groups of women and their partners, such as teenage pregnancies.
- The content is very similar irrespective of the dynamics of the classes.
- Women will make a choice about whether to attend an NHS-run group of classes, whilst others will choose to attend privately run classes such as those run by the National Childbirth Trust (www.nct.org.uk) or a Lamaze trained childbirth educator.
- The physiotherapy content of parent-education classes includes:
  – Coping strategies for labour, distraction techniques in early labour, which can include mobilising, reading, playing games, etc.
  – Advice on early pain relief, such as Transcutaneous electrical nerve stimulation (TENS), massage, keeping mobile, breathing awareness, visualisation and positions of comfort.
  – Positions in labour for the second stage, breathing awareness and how to effectively push.
  – Discussion about after birth care, positions to care for baby when feeding, bathing and changing, discussion on baby equipment, returning to exercise post-natally.

  - Advice given on the increased importance of pelvic floor exercises in the ante and postnatal period, and how to perform effective pelvic floor exercises.
- It is imperative that a full understanding of the birthing process is gained to take such a class and that ideally the physiotherapist has observed a number of deliveries.

Outpatient musculoskeletal care

Pregnancy-related pelvic girdle pain

- Pregnancy-related pelvic girdle pain (PGP) is the general term now used to describe pain, dysfunction and instability in the symphysis pubis joint, sacroiliac joint and/or lumbosacral region.
- The term symphysis pubis dysfunction (SPD) used to be used widely to describe pain and dysfunction in this area and is still used by some GPs, midwives and obstetricians.
- SPD describes a problem with the anterior aspect of the pelvis.
- As the pelvis consists of three bony articulations forming a ring, it is reasonable to presume that disruption at one joint will affect the other two joints in some way.
- This is observed in clinical practice and in line with the European guidelines for PGP the terminology of this dysfunction has been changed.
- PGP can occur at any stage of pregnancy, during delivery or postnatally.
- It is different from diastasis symphysis pubis (DSP) which is confirmed on diagnostic imaging, when it is shown that there is an abnormal pathological, horizontal or vertical displacement of the symphysis pubis (Bjorklund et al 2000). A diastasis of the pubis is classified as a gap of more than 1 cm between the symphysis pubis. Normal gap between these the symphysis is 2–3 cm and it is known to increase to 9 cm in pregnancy with no dysfunction.

Symptoms

- Pain varies between individuals both in severity and location. The common pain distribution areas include:
  - Directly over the symphysis pubis
  - Radiating into the groin
  - Lumbosacral region
  - Lumbar spine
  - Sacroiliac area
  - Anterior and posterior thigh
  - Trochanteric area
  - Pelvic floor and perineal area.
- Women will have difficulty mobilising, often exhibiting a ‘waddling’ gait and have difficulty abducting the lower limbs or performing any activities which involve standing on one leg (such as getting in and out of a bath or car, or going up and down stairs).

- ADL such as household chores, turning in bed, caring for other children and work related activities may be challenging.
- They may complain of a clicking or grinding sensation in the SPJ or SIJs.
- They may report that sexual intercourse is painful or difficult.

Diagnosis

- Diagnosis is reached through the subjective and objective assessment after excluding any other possible diagnosis.
- Differential diagnoses include urinary tract or other infections, renal problems, early labour contractions or Braxton Hicks contractions.
- All women with PGP present differently.
- The key message to remember is that this is a treatable condition that can safely be treated with manual therapy.
- All women should have a full assessment of their pelvic joints and be treated according to the assessment findings.

Possible treatment strategies

- Manual therapy – mobilisations, manipulation, muscle energy techniques, etc.
- Exercise therapy.
- Pain relief – discussion with the multidisciplinary team can help optimise analgesic modalities. Acupuncture and TENS may be of use.
- Advice on ADLs – help where possible from family and friends, back care and ergonomic advice particularly regarding looking after other children.
- Provision of a pelvic girdle support belt can reduce pain and aid mobility in severe cases, as do crutches.
- Women who have a lot of internal stairs in their homes may be helped by a commode to reduce the excessive weight-bearing of repeated stair use.
- Education about the condition is of high importance.
- Advice is crucial in order to limit the pain, this includes advice about periods of rest, maintaining activity within pain free limit, accepting help were possible, planning the day effectively through pacing, avoiding one leg standing positions and asymmetrical pelvic alignment, i.e. sitting down to dress, avoiding crossing legs.

Advice for delivery

- It is crucial that all health care professionals are aware of the woman's condition prior to her delivery. This may involve a case conference or documentation in the women's notes regarding her condition and in particular, to note the width of comfortable hip abduction available a guide through delivery.
- Upright positions to deliver should be taught, such as 4-point kneeling or side lying.

- Active delivery should be encouraged other than in extremely severe conditions.
- It is useful if the woman's birthing partner can be an advocate for her condition.
- Women who require perineal stitching ideally should have this in side lying.
- Refer to www.pelvicpartnership.org.uk for more information.

Postnatal care for PGP

- On the wards, women should have a bed near bathroom facilities, ideally a side room with direct access.
- They should have their analgesia optimised with non-steroidal anti-inflammatory drugs and low potency opiates such as codeine, as management of bowels should be considered with women taking medications which are likely to cause constipation.
- Some women with acute pain may well need a short period of bed rest.
- Mobilisation should be attempted with or without a support belt and/or crutches depending on the severity of the pain.
- Early pelvic floor exercises and core stability should increase the functional recovery.
- An assessment should be made about the level of help required at home and community agency referrals made where needed.
- As an outpatient, the postnatal woman with PGP should be referred to an appropriate physiotherapist who has expertise at the treatment and management of PGP.
- Treatment options are based on clinical findings and similar to that in the antenatal period.
- Standing stork X-ray, MRI or ultrasound investigations may prove useful if pain starts immediately postnatally, or pain and function are not improving (http://acpwh.csp.org.uk/publications/pregnancy-related-pelvic-girdle-painfor-mothers-be-new-mothers).

Back pain

- Back pain is very common in pregnancy.
- Despite this it is important not to allow others to consider it a 'normal' ailment of pregnancy.
- There are multiple reasons for back pain in pregnancy which include the change in posture, increased weight gain, and alteration in the muscle activity causing an 'imbalance' of the activity.
- Back pain in pregnancy is a treatable condition which if not treated may well lead to chronic pain. Postnatal back pain is also common due to the increasing demands of caring for a baby whilst recovering from pregnancy and the birth process.

Symptoms

- Generalised low back pain with or without referred pain.

- May have pins and needles or numbness.
- Pain may refer into the perineum.
- May be associated with PGP.

Possible treatment strategies

- Postural correction (Figure 11.1a, b).
- Manual therapy.
- Exercise therapy.
- Hot/cold therapy.
- TENS/acupuncture.
- Analgesia.
- Support belt.
- Advice about ADL.

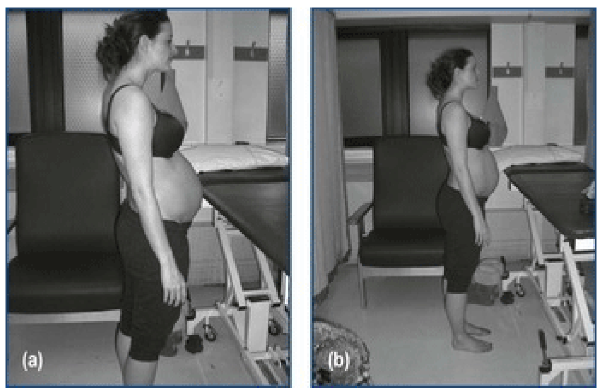

Figure 11.1 (a) Postural changes in pregnancy; (b) posture correction.

Rectus abdominus divarication

- This is a very common condition that occurs when the two rectus abdominus muscle bellies separate at the linea alba and an obvious gap appears.
- It will become evident when a woman pulls herself forward out of bed, bath or performs a sit up.
- During pregnancy it is important to avoid movements where an obvious doming of the abdomen occurs.
- Teaching women how to roll to get out of bed and exercise safely may reduce the gap postnatally; however, the size of the baby and the stretch occurring to the abdomen dictates the gap to a larger extent.
- Teaching and maintaining a strong transversus abdominus is likely to help the postnatal recovery of this muscle.
- Postnatally, the gap should be assessed in crook lying and felt just above the umbilicus.

- A head lift will approximate the muscle bellies so that the gap width can be assessed and monitored through treatment.

Treatment

- Pelvic tilting.
- Core stability exercises.
- Advice about getting in and out of bed without causing further divarication.
- Avoiding excessive straining, lifting and constipation.
- Large L-sized Tubigrip may give symptomatic relief.

Rib flare

- Rib flare usually occurs in the third trimester and is characterised by pain over the lower ribs, it may radiate around the ribs, over the thoracic spine and will increase with any movements of the ribs and thoracic spine such as deep breaths, twisting movements, laughing or coughing.
- It occurs due to the changing angle of the ribs as the fetus grows.

Treatment

- Maitland's mobilisations of the thoracic spine or rib angle may provide pain relief.
- Stretches to mobilise the thoracic spine, such as rotations and side flexions.
- Hot/cold therapy.
- Teaching good sitting postures.

Coccydynia

- Coccydynia is classified as pain over the coccyx.
- It may start insidiously or there may be a history of trauma.
- Pain may develop postnatally after delivery when the coccyx has become bruised or displaced.
- Women will generally report pain on sitting and in changing position.
- Both LBP and PGP can refer to the coccyx.

Treatment

- In an acute phase, ice may help reduce any bruising or swelling.
- Sitting in an anterior pelvic tilted position may offload direct pressure on the coccyx. Coccyx sitting rings can be purchased, alternatively rolled up towels can be placed in a ring to relieve pressure.

- Specific Maitland's joint mobilisation techniques may be helpful.

Carpal tunnel syndrome/wrist pain

- Carpal tunnel syndrome (CTS) is the most common nerve compression syndrome in pregnancy, which occurs due to compression of the median nerve where it passes through the carpal tunnel.
- This probably occurs due to excess fluid pooling around the carpal tunnel in pregnancy.
- De Quervain's syndrome is also seen in pregnancy, where tendonitis occurs at the base of the thumb to extensor pollicis brevis and abductor pollicis longus.

Symptoms

- CTS is characterised by pins and needles and numbness in the median nerve distribution which are worse at night and after waking.
- Also may include general stiffness throughout joints.
- Women may complain of dropping things regularly and have poor grip.
- Women with De Quervain's will have specific pain at the base of the thumb.
- Finkelstein's test can be used to diagnose. Ensure differential diagnosis of radial nerve involvement is undertaken.

Treatment

- CTS- ice packs, resting with the hands in elevation, wrist and hand exercises and wrist splinting, especially at night to limit wrist flexion.
- De Quervain's – frictions, soft tissue massage, ice packs and rest.
- As this is a tendonitis, avoidance of aggravating movements will relieve pain.
- Postnatally a proportion of women will have unresolving CTS and De Quervain's.
- Ensure that the symptoms are not due to adverse neural dynamics.
- Steroid injections may be of benefit for a true De Quervain's.
- Referral to an orthopaedic surgeon with an interest in hand therapy should be made in non-resolving women.

Meralgia paraesthesia

- This condition is characterised by slight sensory loss and/or burning over the anterolateral aspect of the thigh.
- It occurs due to compression of the lateral femoral cutaneous nerve probably due to fluid retention.
- There is no motor involvement and the aim of treatment is to reduce and manage the discomfort.

- Treatment can include TENS and massage and stroking of the affected area.
- Full resolution should occur postnatally once fluid levels in the body and weight have returned to prepregnancy levels.

Round ligament pain

- Round ligament pain is relatively common and occurs due to the stretch of the round ligament which runs from the uterus to the vulva.
- Women will classically report a sudden sharp pain in the lower abdomen on movement, coughing or laughing.
- It should resolve within seconds, causes no harm to mother or fetus.
- There is little treatment that is known to be effective; however, women often find comfort in the knowledge of the cause of the pain.
- There are other causes of abdominal pain which should be referred to a doctor urgently, such as appendicitis, ovarian torsion and preterm labour.
- It is the physiotherapist's responsibility to refer if there are any concerns that the symptoms are not indicative of round ligament pain.

Varicose veins

- Varicose veins are common in pregnancy due to smooth muscle changes.
- The varicoses are usually in the calf, are often painful and women complain about the look of them.
- Advice can be given about brisk walking exercise to encourage efficient venous return through increased muscle activity.
- Circulatory exercises, avoidance of excessive periods of sitting or standing with the legs dependent as well as elevating feet when resting may help the symptoms.

Vulval varicoses

- These varicosities in the vulval area are much less common than varicose veins in the legs.
- Treatment includes advice regarding supportive underwear or wearing a sanitary pad in the underwear to create more pressure.
- Pelvic floor exercise, avoiding excessive standing and constipation may help.

Guidance of the use of TENS in pregnancy

- TENS may be beneficial to women in pregnancy for the treatment of back and PGP after other treatment strategies have been exhausted.

- ACPWH (2007) guidance has deemed that without evidence that it is harmful, and with consensus opinion it is safe to use TENS in pregnancy, especially when the alternative is analgesic medication which crosses the placental barrier.
- The usual contraindications to TENS should be adhered to.
- If women have a history of an irritable uterus, preterm deliveries or miscarriages caution should be taken (see information on the ACPWH website www.acpwh.org.uk).

Emotional needs

- Pregnancy itself is a very emotional period.
- There is a huge amount of change that occurs both physically and emotionally.
- To then have to cope with a pain which is quite severely disabling can bring feelings of depression, inability to cope, anxiety about the impending delivery and future motherhood.
- Understanding women's worries and listening to their goals will in part support their emotional needs through this period.
- Physiotherapists working in this field should also have good links with their local women's health counselors and means of referral.
- They should also be in contact with specialist midwives in their local area.
- Most midwifery services will have midwives who specialise in a specific area of expertise, such as human immunodeficiency virus, obesity, teenage pregnancy or safeguarding and will have experience at managing the more complex obstetric patients.

Postnatal (PN) ward care

Aims of PN care

- To provide information on reducing pain through non-pharmacology mechanisms.
- To teach and advise on pelvic floor exercise and abdominal exercises.
- To provide information on back care and health promotion for the future.
- In the PN period and particularly immediately after delivery, women will have feelings of exhalation and complete exhaustion.
- They may have a painful perineum after a vaginal delivery or a painful incision site from a caesarean delivery, or ongoing LBP/PGP.
- Women often ignore these ailments over the immediate need to look after a newborn baby.
- However, at some point they will seek help and they may remember the physiotherapist who saw them just after having their baby, who gave them some helpful information.

Treatment after a vaginal delivery

- Advice on positions of rest and trying to take rest is important.
- Advice should be given on rolling and getting out of bed without putting stress through abdominal muscles or perineal stitches.
- Women may find putting a hand over their perineum and supporting the stitches through the pad reduces any pain when coughing or performing a Valsalva manoeuvre (such as opening bowels).
- Good positions for feeding the baby.
- Advice on ADL's, such as changing and bathing baby.
- Teach pelvic floor exercises.

Treatment after a caesarean delivery

- Advice on positions of rest and trying to take rest is important.
- Encourage regular analgesia in the early stages.
- Advice on not lifting anything heavier than the baby for the first 6 weeks.
- Advice on not driving a car for 4–6 weeks or until an emergency stop can be performed safely.
- Advice should be given on rolling and getting out of bed without putting stress through abdominal muscles or lower abdominal stitches.
- Women will find comfort from placing a folded towel over the incision and applying pressure when getting out of bed, coughing, laughing and other such movements which stretch the incision.
- Good positions for feeding the baby.
- Advice of ADL, such as changing and bathing baby.
- Teach pelvic floor exercises.

Rationale for pelvic floor exercise post-delivery

- The exercises should be started as soon after delivery as possible.
- After a vaginal delivery, performing some gentle pain-free contractions will reduce swelling and increase circulation, therefore encourage healing of any tear or stitches.
- Long-term pelvic floor exercises may reduce the incidence of developing pelvic floor dysfunction.
- Although elective caesarean section is thought to be partly protective towards the pelvic floor muscles, pelvic floor exercises should still be performed by women after a caesarean section.
- The effect of pregnancy is thought to be damaging to the pelvic floor muscles alone and pelvic floor exercises are important for women to perform as a protective mechanism irrespective of mode of delivery.

Postnatal complications

Perineal tears

- Perineal tears are common in women during labour.
- They are classified dependent on the degree of damage.
- First- and second-degree tears may well not require sutures whilst some second-, and all third- and fourth-degree tears require suturing (Table 11.1).
- It is difficult to predict who will suffer a third- or fourth-degree tear, however risk factors are known to be birth weight over 4 kg, persistent occipitoposterior position, nulliparity, induction of labour, epidural analgesia, second stage longer than 1 hour, shoulder dystocia, midline episiotomy and forceps delivery.
- There is an increased risk of bladder and bowel dysfunction after sustaining a third- or fourth-degree tear, particularly with symptoms of flatal and faecal incontinence.
- The key to managing these tears is to correctly identify them, surgical repair by an appropriately trained registrar or consultant obstetrician and correct postnatal management.
- Postnatal management should initially include antibiotics, laxatives and pelvic floor exercises.
- Women should ideally be seen on the postnatal ward by a physiotherapist who can give advice on defecation techniques, pelvic floor exercises and long-term recovery.
- In some units the physiotherapist will offer them an appointment as an outpatient rather than see them on the ward.
- They should be followed up 6–12 weeks after delivery by a consultant who has a specialist interest in perineal tears.
- Many hospitals have dedicated perineal clinics in which a physiotherapist and specialist consultant will assess and treat this group of patients.
- Women should be asked about any bladder or bowel dysfunction or perineal pain.
- They should have a vaginal examination to assess wound healing, vaginal and anal tone as well as pelvic floor muscle function.
- Symptomatic women and those with poor pelvic floor muscle function should undergo physiotherapy, which would include pelvic floor muscle rehabilitation, treatment of scar pain, advice on defecation techniques and advice on returning to sexual intercourse.
- Symptomatic women may be referred for further tests to assess the integrity of the internal and external anal sphincters and rectal sensitivity.
- Women should be counselled in regards to the previous delivery and questions answered regarding possible future deliveries.

Table 11.1 First- to fourth-degree perineal tears.

First degree	Injury to perineal skin only
Second degree	Injury to perineum involving perineal muscles but not involving the anal sphincter
	Injury to perineum involving the anal sphincter complex:

Third degree	3a: Less than 50% of external anal sphincter (EAS) thickness torn
	3b: More than 50% of EAS thickness torn
	3c: Both EAS and internal anal sphincter (IAS) torn
Fourth degree	Injury to perineum involving the anal sphincter complex (EAS and IAS) and anal epithelium

Other postnatal complications

- Post-partum haemorrhage.
- Uterine infection.
- Perineal infection.
- Caesarean section wound infection.
- Urinary tract infection.
- Thrombosis.
- Respiratory complications.
- Mastitis.

Postnatal exercise classes

- The aim of postnatal exercise classes is to provide an environment in which a postnatal mother can come, usually with her baby, to exercise safely after pregnancy and childbirth.
- The anatomical and physiological changes should be considered when planning a programme with particular emphasis on pelvic floor muscle rehabilitation, abdominal muscle recovery and back care.
- Women are usually ready to come to such a class between 6 and 12 weeks after delivery of their baby.
- There should be a screening process prior to entry into the class, which should include questions about previous delivery history, identification of any perineal discomfort or pelvic floor dysfunction, any musculoskeletal problems during or after pregnancy, general wellbeing and measurement of rectus abdominus divarication.
- The classes may vary in content to include any or all of the following usually over a 6-week rolling programme:
  - Low-level aerobic exercise, working cardiovascular fitness
  - Core-stability-based exercise programme concentrating on pelvic floor muscles and abdominal rehabilitation
  - Advice about progressing exercises and other classes available in the local community
  - Back care advice.

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Useful websites

www.acpwh.org.uk
Association of Chartered Physiotherapists in Women's Health

www.pelvicpartnership.org.uk
The Pelvic Partnership is a group of women, all volunteers, with personal experience of Symphysis Pubis Dysfunction (SPD), which is now known as Pelvic Girdle Pain (PGP).Charity Registered in England no:1100373

www.nct.org.uk
The National Childbirth Trust

Chapter 11

E-materials

Author profiles

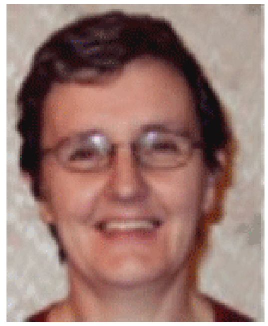
Becky Aston MA MCSP

Becky Aston qualified in 1997 from the University of East London and has been a specialist in Women's Health for more than 10 years. She completed a Post graduate diploma in WH at the University of Bradford in 2002 and a Masters in applied research methods from the University of Brighton in 2010.

She has presented at national and international conferences and published on the subject of pelvic floor dysfunction. Becky has been a member of the Association of Physiotherapists in Women's Health for more than 10 years and has been a member of both the journal and executive committees.

Doreen McClurg PhD MCSP

Doreen is a Reader at the Nursing, Midwifery and Allied Health Professions Research Unit, Glasgow. Doreen has been involved with Women's Health Physiotherapy for many years, mainly working at the Belfast City Hospital. Following completion of her PhD in 2007 she moved to Glasgow to be able to undertake full time research in the area of pelvic floor dysfunction. She is actively involved in the Association of Chartered Physiotherapists in Women's Health and past Chair of the Association of Continence Advice.



Appendix 11.1 Glossary

Braxton Hicks: spontaneous painless contractions of the uterus. These usually occur in the third trimester and are sometimes called ‘practice contractions’

Breech presentation: fetus head is at the uterine fundus (top of the uterus) and the baby’s buttocks lie over the maternal pelvic outlet

Embryo: term from conception to 8 weeks of pregnancy

FD: forceps delivery

Fetus: term for the growing baby after it is 8 weeks old

Full-term delivery: occurs after a gestational age of 37 weeks

Human gestational period: lasts approximately 40 weeks and is split into 3 trimesters each lasting 3 months in duration

Hyperemesis gravidarum: excessive morning sickness – usually occurs in first trimester, but in some pregnancies will continue longer

LSCS: lower segment caesarean section

Puerperium: the 6–8 weeks following birth

Rectus abdominus divarication: separation which occurs between the two recti abdominus muscles

SVD: spontaneous vertex delivery

VD: ventouse delivery

Case Study 11.1

Obstetrics

- Sarah, aged 29.
- 22 weeks into pregnancy has started to get some low back pain and pubic pain.

History of present condition

Gradual insidious onset of both the lower back and pelvic pain.

Pubic pain

Intermittent pain, started at 18 weeks of pregnancy. Pain located directly over pubis, feels like a nagging deep ache with occasional sharp twinges when stands from sitting. VAS at best 0/10, at worst 6/10. Pain does not radiate anywhere else.

Aggravators	**Easers**
Walking for 30 minutes	Reduced pain after rest
After swimming	Less pain on her work days
Worse at the end of the day	
Sexual intercourse	
Sit to stand – sharp pain	

Lower back pain

Has had back pain for a number of years on and off, sees an osteopath every 3 months. Intermittent ache, centrally over lower lumbar spine. VAS at best 0/10, at worst 5/10. No radiating pain, numbness or pins and needles. Reports some leakage of urine when she sneezes and lifts her son up. This started after her last delivery and has got worse since becoming pregnant again.

Aggravators	**Easers**
Bending forward to pick up toddler	Curling up in a ball
Bathing toddler	Ibuprofen used to help, but doesn't want to take it now pregnant
Car journeys more than hour and a half	

Past medical history

- Appendicectomy aged 22.
- Anorexia between the ages of 14 and 19.

Past obstetric history

- Gravida 2 parity 1.
- Forceps delivery 18 months ago, secondary degree tear which required some stitches.

- Current pregnancy, had a lot of morning sickness, vomiting most days. Now just settling.

Drug history

Nil.

Social history

- Lives with her husband and 18-month-old toddler.
- Works 3 days a week as an office manager.
- Is swimming 2 times a week, breast stroke.

Significant points from the assessment

- Posture: Increased lumbar spine lordosis, locks knees in standing and poor abdominal tone.
- Forward flexion in standing demonstrated little lumbar spine flexion, movement gained from hips.
- Anterior–posterior palpation of lumbar spine demonstrated pain from L1–5.
- Pain on palpation of pubis.
- Limited hip abduction due to pubic pain and tight abductors.

Goals

1. To eliminate pubic pain when changing positions.
2. To be able to walk for 30 minutes without pubic pain.
3. To reduce back pain to a VAS of 3/10 when bathing her toddler.

Treatment session one

- Discussed and explained the reason for back and pelvic pain in pregnancy and focused on postural changes that occur.
- Taught pelvic tilting in sitting and standing using a wall in standing to gain concept of 'flattening out' the lower spine.
- Re-educated postural alignment in standing with a long mirror to provide proprioception. Focused on soft knees, finding pelvic neutral, gentle lower abdominal activity, relaxed shoulders.
- Performed a pain-free hold relax technique on hip abductors//gained increased pain-free range of hip abduction.

- Taught a gluteal muscle strengthening exercise as a home exercise programme and advised to avoid breast stroke legs when swimming. To try freestyle legs with a float in the arms or a float between the legs and breast stroke arms.

Treatment session two

- Referred to the back care class for pregnant women for education and general advice.

Treatment session three

- Sarah reported that the pubic pain was much improved. She reported that it was now a 2/10 at the end of the day. She no longer had pain on sit to stand as she was squeezing her gluteal muscles as she stood up – a technique she had learnt in the back care class.
- She had also learnt how to perform a pelvic floor exercise in the back care class and was tightening her pelvic floor muscles as she lifted her son and found she could stop a leak of urine.
- She reported that the back pain was much better, however it felt very stiff at the end of the day and it was difficult to bath her son.

Outcome

Sarah reached all her goals and continued to work on her posture and home exercise programme through the pregnancy. She was contacted 6 weeks after the delivery of her second child and offered an appointment for pelvic floor rehabilitation. She accepted as wanted to improve her bladder control completely.

Possible contributing factors to her pain

- History of bulimia.
- Morning sickness – Valsalva through pelvic floor and weakens support structures.
- Pregnancies close together and small child to care for. Pain was less on her work days when she had less manual handling of her son.
- Breast stroke.
- Poor posture, with poor abdominal support.

Case Study 11.2

Background

- Mrs B, a nulliparous, aged 52 years.
- She worked 6 days a week as a shop assistant.

History of present condition

- Referred to physiotherapy with a 3-year history of urinary frequency with urge and bladder discomfort, that was gradually getting worse.
- She voided from $\frac{1}{2}$- to $2\frac{1}{2}$-hourly during the day with the longer interval being on 'good days'.
- Her micturition commenced without effort, but the flow tended to dribble and if she strained it did not improve.
- She had very occasional minimal stress urinary incontinence with a sneeze, but this was not a problem to her.
- Nocturia was 0–1 times.
- She had to strain at times with defecation, but evacuation was usually complete.
- She commented that she needed time to sit and relax to evacuate.

Assessment

- On examination puborectalis had good contraction (grade 4) with a hold of 3–4 seconds, right pubococcygeus had good bulk and strong lift (grade 5) with a 10 second hold which was slow to release; left had less bulk but good lift (grade 4) hold similar and slow to release.
- She had no awareness of muscle release.
- There was no evidence of oestrogen deficiency.
- On further questioning Mrs B admitted that she was very busy and stressed as she was also looking after her elderly parents.
- She admitted that she was better on her day at home and that she never sat on the toilet seat at work, always hovered above it.
- Her first void of the day was 500 mL and this was emptied without effort or discomfort.
- Day volumes were 25–150 mL.
- Fluid intake was l.5 L and was either tea or water, with an occasional glass of wine at the weekend.

Management

- Mrs B was instructed to place paper on the toilet seat and to sit to void; to take time to fully release the pelvic floor muscles and to use the voiding retraining pattern – lean slightly forward with a normal lumbar curve allowing the abdominal contents to fall forwards.

- The abdomen can then be pushed forward by diaphragmatic descent into a relaxed anterior abdominal wall.
- It was emphasised that she needed to give herself time to empty her bladder completely without straining, and making sure her pelvic floor was relaxed.
- She was also advised to change to decaffeinated tea.
- Defecation retraining was added and her diet was reviewed, but was generally good.
- Within 2 weeks day frequency was reduced, urine volumes increased and discomfort significantly improved.
- However, on stressful busy days there was a tendency for the old habits to return.
- The advice was again re-enforced and goals were introduced, whereby she had to take time out for herself to go to the toilet.

Outcome

- She returned for a final visit one month later and was feeling much more confident.
- She revealed at this appointment that she had been afraid that she was going to end up like her mother who had been incontinent of urine for many years.

Case Study 11.3

Background

- Victoria, aged 47.
- She looks after her family and was the main carer for her father who had been partially disabled by a stroke 2 years previously.
- Victoria's father was relatively independent, needing assistance with certain tasks, e.g. getting in and out of a car, or when showering.
- Her main hobby was going to a keep fit class at the local gym once a week.
- Victoria had 3 children aged 15, 10 and 7 years.

History of present condition

- Victoria was complaining of urinary leakage during her keep fit classes.
- She had a chest infection last winter and first noticed it then.
- She was experiencing some perimenopausal symptoms.

Past medical history

- P1 forceps delivery with stitches.
- P2 and 3 normal delivery though P3 second stage was quick.
- No other significant medical history.

Assessment

- A 3-day bladder diary showed frequency of voiding 7 times per 24 hours, one of which was during the night.
- No bladder pain or dysuria.
- Fluid intake 1.5 L per day, which included 3 cups of tea, and the rest water.
- No history of constipation or previous gynaecological treatment.
- Smear tests were up to date and normal.
- Slightly overweight Body Mass Index (BMI).
- She had stopped smoking 16 years ago.
- On further questioning it was revealed she would tend to have low back pain in the evenings.

Vaginal assessment

- Stage 2 prolapse.
- Episiotomy scarring.
- Weak pelvic floor muscle, grade 1.
- Leakage on cough.
- Urethral position normal.

Drug history

Nil.

Significant points from the assessment

- Weak pelvic floor muscles, which were slow to engage (Modified Oxford score Grade 2) MVC, held for 4 seconds, (repeated 3 times).
- The patient reported a painful area towards the posterior part of the pubococcygeus.

Goals

1. To eliminate leakage when at exercise class.

2. To re-educate the pelvic floor muscles.
3. To teach the patient the self-efficacy by introducing home exercises and self-help techniques.

Treatment session one

- Possible reasons for the development of SUI were explained to Victoria.
- She was shown a model pelvis and diagrams of the vagina, urethra, anus and of the pelvic floor muscles.
- Victoria was given time to ask any questions or air any concerns she may have had.
- Vaginal assessment identified several trigger points on the pubococcygeus and these were treated using modified ischaemic pressures, held for 6–12 seconds.
- The patient was taught a self-help technique 'Sniff, Flop and Drop', an explanation of this technique can be found in Whelan (2008).
- Victoria was advised to use this technique 15 times, twice a day, every day.
- Correct defecation and lifting techniques were also discussed.

Treatment session two (2 weeks later)

- Trigger point release was repeated as per session 1.
- Transabdominal ultrasound scanning was used for feedback to the patient on correct contraction of the pelvic floor muscles.
- The patient was encouraged to continue with the 'Sniff, Flop and Drop' technique at home and to begin gentle pelvic floor muscle exercises and tightening the muscles before coughing or other actions known to produce leakage.

Treatment session three (2 weeks later)

- Victoria reported that she felt less discomfort in the perineal area, although she had not realised there was any.
- Leakage was still present if she was undertaking jumping exercises, but she could prevent it occurring when coughing or sneezing, if she thought about tightening her pelvic floor muscles.
- Further trigger point release was undertaken, but the area was found to be less sensitive. Pelvic floor muscle training was encouraged, as she could now maximally release.

Treatment session four (1 month later)

- Victoria reported that she felt much more confident about attending her keep fit class.

- To supplement her PFM she was instructed to undertake a submaximal transversus abdominis contraction just before tightening her pelvic floor.
- Using the ultrasound imaging it was possible to see that this reduced the bladder neck descent even further.
- Victoria was instructed to continue her home exercise programme, gradually increasing the length of hold, and also increasing the number of fast contractions.

Treatment session five (1 month later)

- Victoria was feeling much more confident and reported that she now felt in control of her bladder.
- She was able to attend keep fit sessions, usually with no leakage.
- Her original goals had been reached and the patient was discharged with the advice to continue a maintenance programme of exercises.

Reference

Whelan M. *Therapeutic management of incontinence and pelvic pain*, second ed. London: Springer; 2008. Chapter 11B, pp 95–98

Chapter 11 Obstetrics and gynaecology multiple choice questions

1. After 12 weeks of pregnancy, the placenta produces the hormone relaxin. Which of the following statements is incorrect?
    a). Up to 28 weeks of pregnancy relaxin causes inhibition of myometrial activity
    b). Relaxin causes collagen to become more extensible
    c). Relaxin causes increased hair growth
    d). Relaxin allows the uterus to distend as the foetus grows
2. Which of the following statements is incorrect?
    a). The effects of progesterone cause slow peristaltic gut movement leading to constipation
    b). Relaxin increases steadily up to 37 weeks of pregnancy
    c). Oestrogen causes an increase in water retention
    d). Oestrogen, progesterone and relaxin are produced by the corpus luteum until 12 weeks of pregnancy
3. There are many minor ailments of pregnancy, which of the following is not one of them?
    a). Pre-eclampsia
    b). Carpal tunnel syndrome
    c). Varicose veins
    d). Insomnia
4. Which is the false statement?
    a). Pregnant women may be able to lie prone for assessment if they are comfortable
    b). Straight leg raise with and without compression is useful in the diagnosis of PGP

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   b). Carpal tunnel syndrome
   c). Varicose veins
   d). Insomnia
4. Which is the false statement?
   a). Pregnant women may be able to lie prone for assessment if they are comfortable

b). Straight leg raise with and without compression is useful in the diagnosis of PGP
c). Pregnant women should not lie supine at any stage of pregnancy
d). Manipulations are not contra-indicated in pregnancy

5. What is not a clinical symptom of pelvic girdle pain?
a). Pain radiating into the groin
b). Pain radiating into the pelvic floor area
c). Pain in sciatic nerve distribution
d). Pain in lumbosacral region

6. Physiotherapy-led parent-education classes do not classically include which of the following?
a). Information on baby vaccinations
b). Coping strategies for labour
c). Birthing positions and breathing awareness
d). Pelvic floor exercises

7. Carpal tunnel syndrome is a very common condition in pregnancy. Which of the following treatments is unlikely to help?
a). Ice packs
b). Serial casting
c). Elevation
d). Wrist splints

8. What is meralgia paraesthesia?
a). A dangerous obstetric condition, which needs immediate medical attention
b). A nerve compression problem, which causes temporary foot drop
c). A compression of the lateral femoral cutaneous nerve
d). A benign uterine growth

9. In the postnatal period, pelvic floor exercises are thought to be beneficial for a number of reasons, which of the following will they not help with?
a). Weight loss
b). Reducing swelling
c). Increasing circulation and healing
d). Muscle strengthening

10. Which is the true statement?
a). Back pain is common in pregnancy and automatically gets better after delivery
b). The cause of back pain is due to the hormonal change and therefore is not treatable
c). Women with coccydynia will find it difficult to sit down without pain
d). The use of TENS is contraindicated in pregnancy

11. A women who leaks urine only when jumping has
a). Urge urinary incontinence
b). Stress urinary incontinence
c). Nocturia
d). Dysuria

12. Following surgery for prolapse the re-occurrence rate is approximately?

a). 5%
b). 10%
c). 30%
d). 50%

13. Antimuscarinic medication is sometimes prescribed for
a). SUI
b). Urge urinary incontinence
c). Nocturia
d). Faecal incontinence

14. Several factors may predispose the development of urinary incontinence. Which is false?
a). Being overweight
b). Smoking
c). Driving
d). Pregnancy

15. A post-void residual of more than 100/150 ml is considered high. In which condition would this not be found?
a). Stress urinary incontinence
b). Poor detrusor contraction
c). Detrusor sphincter dyssynergia
d). Prostatic enlargement

16. If a woman feels she needs to pass urine when out shopping she should
a). Hover over the toilet seat to avoid getting infections
b). Sit on the toilet seat
c). Hold on until she gets home
d). Limit her time away from the house so she does not need to use a public toilet

17. Which one of the following does not cause/affect urinary leakage
a). Low oestrogen levels postmenopausal
b). Taking an oral contraceptive
c). Having a shower
d). Laughter

18. Urinary incontinence occurs more often in the elderly. Which is the false statement?
a). It is an inevitable part of ageing
b). It increases the likelihood of falls
c). It may be due to drugs prescribed for non-urological conditions
d). Faecal impaction can exacerbate urinary incontinence

19. Which of the following may develop following a TAH and BSO
a). Urinary incontinence
b). Eczema
c). Osteoarthritis
d). Miscarriage

20. Which of the following may be used as conservative treatment for pelvic organ prolapse

a). Cranberry juice
b). Pelvic floor muscle exercises
c). Cervical collar
d). Antibiotics

Obstetrics and gynaecology multiple choice answers

1. c)
2. b)
3. a)
4. c)
5. c)
6. a)
7. b)
8. c)
9. a)
10. c)
11. b)
12. c)
13. b)
14. c)
15. a)
16. b)
17. b)
18. a)
19. a)
20. b)

- Enquire from the patient if they have had any problems since the initial assessment and what the specific nature of the problem is.
- In an outpatient or community setting where the patient has been referred for a specific problem, it is important to give a patient the opportunity to share other problems too.
- As an example the following statements represent the interaction that may occur:

'Following the assessment last week how have you been feeling?'

'Was there anything that you wanted to talk about last time you were here?'

'Is there anything else I can help you with?'

- These questions provide the patient with an opportunity to raise other issues that concern them.
- Following the initial assessment a patient may have had time to reflect on their issues.
- This can happen after specific questions have been asked, which may not always happen as people are often frightened of asking the 'wrong thing'.
- The patient may decide to change the priorities that they decided on a previous attendance, this is an indication that the patient has engaged with the process and not avoiding confronting the problems that need to be dealt with.
- Sometimes this conversation may bring out information that was previously unknown and indicate the underlying anxieties that a patient may have.
- Throughout the treatment, the patient should be encouraged to express feelings. For example, it may be appropriate to ask 'is there anything about the treatment that worries you?'. 'What is it about the treatment that concerns you?'
- The physiotherapist may get a chance to find out about the patient's anxieties. For example:

Patient 'I don't want to die the way my brother did'

Therapist 'What do you mean by that?'

Patient 'Well, he became very different in the end, it was not very dignified and that upset me'

- Sometimes patients have concerns about their quality of life. Reflecting a question back to the patient may allow deeper meanings to be aired, for example:

Patient 'Will I ever get out of this wheelchair and walk again?'

Therapist 'Why do you ask?'

'Well, I really don't want to carry on if I am going to be in a wheelchair forever'

- It may be useful to verify what the patient has just said to avoid any misunderstanding.

Therapist 'When you said you wouldn't want to carry on what do you mean?'

- It is not always possible to provide a direct answer to a direct question from a patient particularly in terms of prognosis.

- It is best to be honest and maintain hope during communication and therefore a vague answer to questions initially will allow their response to be gauged.
- More specific details may be given depending on the reaction of the patient or if they request more information.
- It is not always possible to provide answers to the questions asked by patients as in many cases the answer may not be clear.
- Always give the patient enough time to talk in the way that they want to, encourage them to talk but avoid pressurising them. For example:

  Patient 'I feel frightened ...' (pause)

  Therapist 'Sometimes you feel frightened about ...'

  Patient 'Sometimes I feel frightened that I will not be in control of what happens to me'

- The physiotherapist should be aware of the patient's need to talk and provide opportunities for this to happen, however there may be times when the conversation begins to uncover issues that are beyond the ability of the physiotherapist to manage.
- In these cases it may not be appropriate for a conversation to be continued and the physiotherapist will need to discuss this with the patient and offer alternative options for issues to be discussed.
- In these cases the physiotherapist should be aware of the appropriate professional to refer the patient to.
- The physiotherapist may not always know the answer to a question. It is important to acknowledge this by saying 'I don't know' or 'I'm not sure about that'.
- Offer to find out the answer to the questions or the most appropriate person to provide the answers.
- It is important to remember that patients may want to know certain things at different times during their illness and the physiotherapist must be sensitive to these changing needs to avoid upsetting the therapist–patient relationship so necessary for achieving treatment outcomes.

Goal setting

- Any additional information disclosed by the patient following the initial assessment may lead to the treatment goals that were set following the initial assessment needing to be re-evaluated and reset.
- The goals will need to be discussed with the patient and jointly agreed as being practical and achievable in the short, medium and long term as necessary.
- The physiotherapist must always try to engender the possibility of the patient achieving success and not allow goals to be unattainable.

Multidisciplinary working

- The key to successful physiotherapy treatment in oncology and palliative care is working closely as part of a MDT.
- This will provide a continuum of care through diagnosis, treatment and survivorship.
- This group of patients can have complex and multifactorial issues that need to be addressed by a team with relevant skills and knowledge.
- The physiotherapist should ensure consideration is given to all aspects of the patient's problems, and involvement of other members of the team is arranged when necessary.
- NICE have described the domains of care in cancer rehabilitation and each assessment of a patient's rehabilitation needs should consider:
  - Physical, which includes optimising functional ability and management of symptoms such as breathlessness or fatigue
  - Nutritional involves optimising nutritional status to ensure maximum benefit from physical programmes; management of nutrition-related symptoms
  - Psychological, involves health care professionals recognising signs of psychological distress or developing knowledge and skills to deal with certain levels of distress
  - Informational, material provided for the patient in written, audio and visual format
  - Practical, development including activities to enhance daily living or returning to work
  - Spiritual, involves finding personal value; identifying personal meaning; seeking, finding and maintaining hope; being able to express emotions
  - Social, covers relationships, socialising, hobbies and pastimes
  - Financial, concerns such as being able to pay the rent or mortgage, loss of earnings; travel and other types of insurance (NICE 2004).
- If the physiotherapist is unsure if referral to another professional is indicated they should discuss this with a senior colleague or with the other professional directly in order that each individual case is given due consideration.
- Working in a close MDT in oncology or palliative care can be one of the most rewarding aspects of this specialty and is one thing likely to provide maximum benefit to the patient.
- Living with advanced incurable disease can affect all aspects of life, creating psychological, spiritual, and existential challenges as well as demands for symptom control and physical care. It is therefore rarely, if ever, possible for any one professional to meet all the needs of a patient or family (Haugen et al 2009).

'A single profession, like a single model of care, cannot meet the holistic, fluctuating needs of patients and carers. The knowledge and skill of many professions including medical, nursing, pharmacy, social work, physiotherapy, occupational therapy and chaplaincy bound together by communication and teamwork is vital' (Mount et al 2006).

Psychological aspects

- It is vital to consider the psychological aspects of being diagnosed with and living with cancer or a life-limiting illness when considering physiotherapy management.
- The common issues are discussed below.

Anxiety and depression

- Fear and anxiety are normal reactions to stressful situations, such as those undergoing treatment for cancer.
- Depression is when a patient's mood is low most of the time for several weeks or more and the relationship between cancer and depression is complex and multifactorial.
- The physiotherapists should be aware of the issues and be able to identify the patients who may need referral on to a specialist.
- Common presentations can be breathlessness, muscle tension, dizziness, sweating and panic attacks, all of which may be identified by a physiotherapist.
- Depression may also be expressed by a patient with no motivation, or who feels helpless, hopeless or guilty or to blame.
- The most common anxiety and depression assessment scales used in a health setting are the Hospital Anxiety and Depression Scale (HADS) or the Brief Edinburgh Depression Scale (BEDS).
- Both scales are simple and short, providing a pragmatic method of screening for anxiety and depression.
- Mild anxiety and panic attacks may be eased by the physiotherapist teaching simple relaxation techniques or the patient taking part in gentle exercise with support.
- Treatment may consist of active listening and allowing the patient to share their concerns, fears and frustrations.
- If the physiotherapist does not feel able to manage the patient's problems or feels they need further investigation it is essential to refer on to the relevant member of the team, which may be a social worker, counsellor or psychologist.

Breathlessness

- Twycross (2003) defined breathlessness as 'the subjective experience of breathing discomfort'. Breathlessness has been noted to be 'subjective and like pain, it involves both perception of the sensation by the patient and their reaction to the sensation' (Heyse-Moore et al 1991).
- Therefore, the patient's emotional state and other symptoms can and will have a direct impact on the symptom of breathlessness.
- The treatment of breathlessness in oncology and palliative care employs similar techniques to those used in respiratory physiotherapy.
- The evidence shows that non-pharmacological management of breathlessness is effective for both malignant and non-malignant disease (Bausewein et al 2010; Bredin et al 1999,

Corner et al 1996).

- Before providing specific advice, it is helpful to provide the patient and family some basic education about the anatomy and physiology and the functions of breathing. This should be done at an appropriate level for each individual and once a patient has a good understanding of how the lungs are structured and work, often this will lead to an alleviation of anxiety.
- The following are suggestions that may assist the patient, the technique must feel comfortable for the patient or they may increase anxiety:
  - Get in a position to ease shortness of breath, e.g. forward leaning (Appendix 12.7)
  - Try to make the breath out twice as long as the breath in. This requires practice as patients often focus on inspiration
  - Breathe out through pursed lips
  - Time walking to the breathing, e.g. step one – breathe in; step two and three – breathe out. This is a useful technique to use when climbing stairs
  - Give advice in the presence of family and carers, as their behaviour can affect the patient's breathlessness. The physiotherapist should make sure family and carers understand that the patient should not try to converse when short of breath and they should support the patient in whichever way the patient prefers, e.g. holding their hand
  - Use a hand held or table fan to help reduce the shortness of breath and ease anxiety.
- The following are suggestions to manage breathlessness when carrying out daily activities:
  - If bathing, don't have the water too hot or too deep and let the water out first before you get out
  - If showering, don't have the shower head spraying into your face and make sure a window or door is open for ventilation
  - After washing, wrap yourself in a toweling robe and rest until able to continue
  - When dressing, do as much sitting down as possible
  - Avoid bending over at the trunk, try to kneel or sit if working at low level
  - If gardening try to move plants into pots and work at waist height
  - In the kitchen, have frequently used items at worktop level or above to avoid unnecessary bending.

Pacing and planning

- It is important when breathless to plan and pace daily activities and social events allowing periods of rest between activities.

Anxiety and relaxation

- Breathlessness will often cause anxiety and can be a very frightening experience.
- Education and reassurance will often ease some of this distress but simple relaxation

techniques may also be useful.

- The most commonly used methods include simple diaphragmatic breathing and progressive muscle relaxation.
- Any relaxation method must be tailored to the patient and their preferences.
- Some patients may also find the calming hand tool useful which was designed to help control panic attacks (Burnett and Blagbrough 2007).
- Good control of breathlessness can alleviate both physical and psychological distress to patients and their families and therefore can have a significant impact on quality of life.
- The physiotherapist does not aim to alleviate the breathlessness, but to help teach the patient how to manage the symptom.
- These techniques are appropriate for anyone suffering from breathlessness, due to cancer or any other condition.
- For further information see the breathlessness rehabilitation pathway (NCAT 2009a) available online.

Body image

- The image we have of ourselves is our own impression of our physical appearance and what sort of person we feel we are.
- This image is built up over time from observing ourselves, the reactions of others, and a complex interaction of attitudes, emotions, memories, fantasies and experiences, only some of which we are aware of (Regnard and Kindlen, 2002).
- Our body image is also affected by social interactions and how we relate to others, our feelings of achievement and self worth, our sexual image of attractiveness and our spirituality and morality.
- Cancer and its treatment can produce various temporary and permanent changes which can have a devastating effect on patients' feelings and their attitude to their own body which can affect their psychological health.
- It is often thought that body image problems should be referred for psychological assessment and treatment but it is the responsibility of all health care professionals to be aware of body image issues in the oncology and palliative care setting.
- The physiotherapist's ability to actively listen to the concerns of the patient are of paramount importance, and often a simple open discussion and acknowledgement can help to bring down barriers, reduce feelings of isolation and fears of rejection.
- The focus of intervention in the body image services generally covers seven domains and it is important that the physiotherapist has an awareness of these areas of treatment as some of them may sit well with standard physiotherapy interventions and planned outcomes (Box 12.2).
- Work in these domains can improve perception of body image by working on self esteem, anxiety and mood, increase coping efficacy in situations that are challenging, increase social activity and improve relationships with others.
- Whilst awareness of body image treatments is essential the physiotherapist must be

aware of their own competencies in communication skills and must not hesitate to liaise with other more experienced members of the MDT.

Box 12.2 Management of body image, the seven domains

1. Camouflage and masking
   The use of clothing to cover or shield an area, such as a scarf, jewellery or make-up
2. Functional adaptation – e.g. use of a stick for proprioception in peripheral neuropathy
3. Enhancing self worth through
   a). compassion through touch therapy
   b). competencies and achievements
4. Supportive expressive therapies – disclosure and counselling
5. Desensitisation programme – gradual exposure formally or informally as in repeated consistent reactions of others
6. Enhancing coping strategies by
   a). goal setting – identify desired outcomes
   b). reframing – challenging assumptions and beliefs
7. Compensatory activities with a pleasure focus, i.e. generate positive mood states

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Hope

- Hope has been described as 'a multidimensional dynamic life force characterised by a confident yet uncertain expectation of achieving future good, which, to the hoping person is realistically possible and personally significant' (Dufault and Martocchio 1985).
- The fostering of hope and the prevention of feelings of abandonment are part of the physiotherapeutic intervention (Doyle et al 2005).
- Hope needs a goal and realistic goal-setting is a core physiotherapy skill.
- Patients need attainable goals to help maintain a sense of control and to reframe a vision for the future.
- Some patients choose to avoid receiving information as a strategy to maintain hope therefore gentle honesty, empathy, optimism and excellent communication skills are required to navigate the patient through the uncertain course ahead.
- Living with incurable progressive disease does not necessarily mean living without hope.
- Kylma et al (2009) conducted a review of 34 articles and identified key factors contributing to and threatening hope in palliative care.
- Some of the key factors that are of particular relevance to physiotherapists are listed in Table 12.1.
- Because hope is inextricably linked with life, health and illness, it has become an essential component of healthcare.
- As well as supporting the patient it is important to give emotional support to the patient's significant others, as they will be jointly involved in fostering hope in the patient.

- Suggested hope-fostering interventions include:
  - Affirmation of the patient's worth/being present to the patient
  - Working with the patient holistically/taking time to talk/creating a partnership
  - Focusing on life while facing a future of a potentially shortened life
  - Helping the patient to engage actively in own care
  - Keeping an open, positive perspective on the future
  - Assisting to devise and revise realistic, meaningful goals
  - Supporting the patient's hopes and wishes
  - Encouraging the patient to share fears
  - Giving information in response to the patient's need for information.
- The wider the gap between the patient's expectations and the reality of the situation, the poorer quality of life will be.
- 'The gap between hopes and realities may be narrowed by improving patients' function by treatment or by reducing their expectations through better understanding of the limitations imposed by their disease' (Calman 1984).
- In curative hope work, the patient is defined as getting better; in palliative hope work, the patient is defined as feeling better.

Table 12.1 Key factors relating to hope

Factors supporting hope	**Factors threatening hope**
Attainable goals that help to maintain a sense of control	Physical or emotional loss
Affirmation of worth	Losing the future
Honest information	Loss of healthcare professionals interest
Symptom management	Devaluation of personhood
Trust in care	

Kymla et al 2009.

Preventative advice

- Some problems in oncology and palliative care may be prevented or their impact reduced by implementation of preventative advice.
- In many cases this will be in the form of education for the patient about possible risks of complications or problems that may arise due to their disease process or treatment effects.
- This could be issues such as risk of lymphoedema or range of movement problems or early advice on managing fatigue or breathlessness.
- It is also important to advise on problems that may arise simply from a lack of knowledge or understanding, such as weakness or reduced mobility due to lack of activity.

- It is vital that patients are given such advice early in their physiotherapy management to put the patient in better control of their condition and make them more aware of when to seek further help or support.

Exercise tolerance and deconditioning

- Weakness and deconditioning due to lack of exercise are common problems in cancer sufferers.
- Cancer treatments too by their very nature are toxic to the body and the resulting loss in physical functioning can be severe.
- Within the palliative care setting patients can have significant muscle weakness and mobility issues and the complexity of a combination of symptoms can be a challenge to the physiotherapist.
- Complicated syndromes such as cachexia have a marked effect on muscle mass and exercise tolerance.
- Cachexia is due to a derangement in the body's metabolism due to factors produced either by the tumour or by the body in response to the tumour, e.g. cytokines (Hawkins 2007a).
- In general activity has proven to be beneficial in the cancer patient and the assumption that rest will help increase energy levels and exercise tolerance should be challenged (Hawkins 2007b).
- Another common problem can be the onset of proximal myopathy due to the use of steroids.
- The mechanism of this process is not fully understood, but it is important that patients are aware of this side effect of steroid treatment and are given exercise advice to raise their awareness and help reduce the effect this may have on their function.
- Guidelines for exercise prescription are outlined in Box 12.3. The fundamental principles of exercise such as frequency, intensity and duration are well known to the physiotherapist.
- The progression, adaptation and individuality of exercise prescription apply equally to the cancer patient at all stages of illness and should be as a result of a thorough assessment and with agreed achievable aims and goals.
- Exercise should be monitored using a variety of tools that will provide the information required to gauge the effort expended by a patient, e.g. Borg scale for perceived exertion, pulse oximetry or a timed walk test.
- Be aware special considerations that pertain to cancer rehabilitation patients and use comprehensive assessments to develop appropriate exercise interventions.
- Continuously monitor the patient's response to exercise and maintain a record of exercise, effects and progression.
- The contraindications to exercise for patients with cancer are similar to other patients with a few additions, e.g. fever, cardiovascular instability, untreated deep vein

thrombosis or pulmonary embolism and neutropenia.

- In palliative care the emphasis is on 'little and often' (pacing), the targeting of weakened areas and avoiding exhaustion.
- Exercise prescription should take into account potential sudden variations in symptoms and be able to be adjusted accordingly.
- It is vitally important to agree with the patient and family realistic goals and so minimise demoralising failure.
- It is important to note that patients may be managed in a palliative care environment for a considerable time, sometimes years and therefore they can often tolerate moderate levels of exercise based on their symptoms.

Box 12.3 General guidelines on exercise in oncology and palliative care (Courneya and Mackay 2001)

- Patients should be encouraged to maintain normal functioning, mobility and activity
- Exercises should involve large muscle groups
- Frequency should be 3–5 times a week, but daily exercise could be more beneficial
- Duration should be at least 20–30 minutes of continuous exercise, but may have to be in shorter bouts for individuals with poor conditioning
- Progression should increase in frequency and duration first followed by increase in intensity as the patient becomes more fit
- The progression should be gradual, especially for patients with severe side effects of treatment
- Exercise/movement should be tailored to patient needs, ability and disease status
- Appropriate warm up/cool down phase as part of exercise to avoid exacerbation of swelling
- Compression should be worn during exercise

Types of exercise

- Start with low- to moderate-intensity exercise
- Paralysed limbs can be moved passively
- Walking, swimming, cycling and low-impact aerobics are recommended
- Heavy lifting and repetitive motion should be avoided
- Flexibility exercises maintain range of movement

Precautions

- Care must be taken with symptom management and there should be continuous monitoring with certain issues such as bony metastases, poor balance, dehydration,

nausea, fatigue, skin reactions, peripheral neuropathy, postural hypotension, body image, pain and thrombocytopenia.

Mobility

- Mobility and function are two common determinants of a patient's quality of life.
- Evidence suggests that there is a positive association between physical activity and quality of life (Helbostad et al 2009, Lowe et al 2009).
- Patients should have access to an appropriate level of rehabilitation to facilitate function at a minimum level of dependency and optimise their quality of life, regardless of life expectancy.
- The challenge increases with disease progression; the physiotherapist can help the patient and carers decide which activities they can realistically perform, within the limits of energy, safety and capabilities and can assist them to devise a strategy for the future.
- The physiotherapist's role is to help the patient adapt to their changing condition and anticipate and prepare for any likely disease progression, while maintaining hope.
- In oncology and palliative care, mobility problems may arise for many reasons. They may be:
    - Related to the illness
    - Related to the treatment for the illness
    - Related to debility
    - A concurrent disorder.
- Due to the diversity of the presenting problems, a range of techniques may be employed to address the various aspects of mobility problems which may include:
    - Active exercise
    - Gait re-education (including the use of orthoses or walking aids)
    - Analysis of movement and posture
    - Normal movement techniques
    - Pain management
    - Lymphoedema management
    - Balance training
    - Activity pacing
    - Fatigue management
    - Transfer practice
    - Wheelchair assessment
    - Skin care
    - Education of family and carers regarding moving and handling techniques
    - Referral on to other agencies as appropriate.
- Where possible it is advisable to liaise closely with an occupational therapist to ensure an optimum outcome for the patient.
- A wide range of mobility aids are available to meet the diverse needs of this client group

and the selection of the appropriate device is essential. This should be based on:

  – The type of assistance needed, for example, to reduce weight bearing for the relief of pain, or to correct balance
  – The overall physical and cognitive abilities
  – The care setting in which the device will be used.

- It is important to review the suitability of mobility aids regularly to ensure that they continue to meet the patient's current needs.
- The physiotherapist should plan for likely disease progression and deterioration in order that the necessary equipment is in place in a timely fashion.
- As deterioration occurs, the patient may need greater assistance to maintain their functional ability.
- At some point, the focus on function will diminish and comfort will become the priority.
- For further information see the mobility and loss of function rehabilitation pathway (NCAT 2009b) available online.

Fatigue

- Cancer-related fatigue (CRF) is a complex multifactorial but common symptom of cancer patients in all phases of treatment, recovery, advancing disease and palliative care.
- It has been described as a common persistent and subjective sense of tiredness related to cancer or to treatment for cancer that interferes with usual functioning and 70–100% of cancer patients suffer with CRF (Lundh Hagelin 2006).
- Education and information about cancer-related fatigue should be given to the patient as early as possible, ideally prior to treatment commencing, with the aim of reducing any potential distress and frustration that fatigue may cause.
- It must be remembered that fatigue is often the first sign of ill health and specifically in cancer sufferers a potential indicator of disease status and therefore can induce fear and anxiety.

Fatigue management advice

- It is important for all healthcare professionals to be able to identify cancer-related fatigue and be able to supply basic advice and written material about the condition.
- Macmillan information sheets on cancer-related fatigue are freely available for download or hard copies can be ordered from the website and this is an excellent source of information for patients. www.macmillan.org.uk
- The same principles can also be adopted for patients with non-malignant conditions who are suffering fatigue.
- Educate the patient about the importance of food as a fuel.
- If eating is difficult liaise with dietetic colleagues or the MDT about nutritional supplements.

- Consider complex syndromes such as cachexia which can have a marked effect on muscle mass and exercise tolerance and the importance of dietetic input for this condition.
- Teach patients the five P's of energy conservation
  - Plan – always try to plan ahead
  - Pace – your activities, i.e. do a bit, rest a bit
  - Prioritise – what's important
  - Posture – think about your position, could you sit and do it
  - Permission – should you do it, delay it, delegate it, or dump it.
- Fatigue can be considerable during the first 72 hours post chemotherapy.
- The effects of both chemotherapy and radiotherapy are cumulative, so mild to moderate intensity exercise is appropriate.
- The programme should incorporate a cardiovascular component such as walking in conjunction with targeted strengthening exercises and monitored progress.
- Exercise should be timed so as not to exacerbate symptoms of treatment.

Long-term patients and fatigue

- The patient on long-term follow up who has completed treatment and who is still suffering fatigue often has a poor understanding of the long-term effects of treatment.
- Their aims and expectations of activity are often unrealistic and a negotiated exercise plan with short- and longer-term goals needs to be negotiated.
- This should target weakened areas, include aerobic exercise and a gradual increase in intensity and duration.

Fatigue and palliative care

- Fatigue in palliative care patients is often complex with hourly or daily variations.
- Thus exercise must be safe and relevant to the symptoms, involving close liaison with the MDT.
- The exercises should be aimed at prevention of loss and maintenance of functional ability and will help to give a positive focus for the patient and family.
- For further detail see the fatigue and energy management rehabilitation pathway NCAT (2009c) available online.

Specific conditions and interventions in oncology and palliative care

Bone metastases

- Bone metastases or 'bone mets' are a common finding in certain advanced cancers, particularly breast, prostate, lung and kidney (Cancer Research UK 2008).
- When cancer cells spread to the bone, they commonly lodge in the spine, rib cage, pelvis, limbs and skull. These cells can damage the bone and this may give rise to a number of different symptoms.
- Patients will often have localised pain in the affected area, but this may be referred. Initially, it may come and go and may be worse at night.
- However, it is important to note that not all pain indicates metastasis. In some cases a bone affected by metastasis may become weakened as the process of bone remodelling is destroyed. This is seen particularly in the femur and humerus, which can be at risk of fracture. In some cases this is the first sign of bone metastasis.
- Bone metastases are also common in the spine and can lead to risk of metastatic spinal cord compression (MSCC). Although caution must be taken with a patient diagnosed with, or at high risk of developing bone metastases, physiotherapy intervention is not contraindicated (Crevenna et al 2003).
- Treatment planning must be on an individual basis and aim to design a programme that combines safety and bone protection strategies, i.e. use of bisphosphonates which slow the bone damage caused by metastasis (Ramaswamy and Shapiro 2003). It is important to use mobility and strengthening goals where appropriate. There is very little research on the topic of physiotherapy and bone metastases therefore research on breast and prostate cancer and osteoporosis provide the best evidence (Schwartz et al 2007).
- Maintaining mobility is important for many patients and the risks and benefits must be considered in full consultation with the patient and MDT.
- It is also important to work alongside other treatment regimens such as radiotherapy. This is often a treatment choice which is useful in relieving pain and controlling the growth of the tumour cells in the particular area (Fairchild et al 2010).

Lymphoedema

- Lymphoedema may occur as a result of the treatment of a tumour due to accumulation of fluid and other elements (e.g. protein) in tissue spaces, due to an imbalance between interstitial fluid production and transport (usually a low output failure).
- Lymphoedema may manifest as swelling of one or more limbs and may include the corresponding quadrant of the trunk.
- Swelling may also affect other areas, e.g. head and neck, breast and genitalia.
- Lymphoedema treatment may incorporate several aspects of care and the emphasis is for self management as far as possible.
- These include skin care, exercise, simple lymphatic drainage (SLD) and compression and are termed the four cornerstones of care.

Skin care

- Daily skin care to maintain healthy skin is essential and patients are advised to moisturise 1-2 times daily with appropriate emollients treating any cuts or grazes to prevent infection.

Exercise

- A system of isotonic exercises, working proximally to distally.

SLD

- A gentle specific massage technique to improve lymphatic flow, which the patient can do for themselves or which can be carried out by a carer.

Compression

- Suitable compression garments will be measured by a lymphoedema practitioner if appropriate and should be worn as prescribed.

Specialist intervention

- Specialist intervention may be required for larger or more problematic lymphoedema and may include manual lymphatic drainage (MLD), multi-layer lymphoedema bandaging (MLLB), kinesiotaping and, rarely, intermittent pneumatic compression.
- Kinesiotaping is a taping method that can substantially aid lymphoedema by increasing the body's ability to drain lymphatic fluid to healthy lymph nodes, i.e. specifically aid lymphatic drainage. Please refer to kinesiotaping UK online for further information.

Palliative care

- In palliative care the focus of treatment depends on symptom relief and quality of life and therefore appropriate interventions should be used such as light support bandages rather than compression hosiery.

Role of the physiotherapist

- The physiotherapist should reinforce lymphoedema prevention and can initiate simple treatments to alleviate some of the physical problems associated with lymphoedema supporting the agreed management plan prescribed by the lymphoedema practitioner.
- Basic advice such as good skin care should be promoted, with regular moisturising using gentle upward strokes to help reduce the risk of infection.
- Wearing compression hosiery should be advised if prescribed and especially worn during exercise and regular SLD encouraged.

- The lymphoedema patient, however, often has associated problems such as muscle weakness, joint stiffness, complex scarring, poor posture and pain and is often fearful of exercising.
- The physiotherapist is ideally placed to offer advice and treatment for postural correction, positioning, scar work, range of movement, myofascial release, and to promote normal activity.
- The physiotherapist should be aware of the general guidelines on exercise as recommended by the lymphoedema framework.
- Patients may find the physical symptoms of lymphoedema impact on body image and may raise fears of recurrence.
- They present with confidence issues, anxiety and low mood. Our core physiotherapy skills can have a positive impact on effective self management by improving associated symptoms and by working within the MDT to promote effective self care.

Metastatic spinal cord compression (MSCC)

- MSCC is an oncological emergency, requiring precise assessment of symptoms, urgent investigations and immediate treatment.
- The physiotherapist must have an understanding of cord compression to enable a thorough assessment and to devise an accurate treatment plan.
- Rehabilitation for patients with MSCC improves functional outcomes and patients who achieve high functional gains may have better survival (Tang et al 2007).

Spinal cord compression checklist

- The physiotherapist may use a similar checklist to the one in Table 12.2 to assure a consistent and thorough assessment and treatment plan.

Table 12.2 Example of a treatment checklist

Treatment	
Passive/assisted/active exercise	
TA stretches	
Calf massage	
Specific stretches	
Respiratory monitoring and management	
Assisted cough	
Progression of sitting	
Advice to patient of symptoms to be aware of	
Reporting to nursing staff	
Close monitoring with baseline assessment	
Rolling	

Sitting over edge of bed through rolling	
Lying to sitting	
Sitting balance assessment and exercise	
Sitting to standing as appropriate	
Ambulation as appropriate	
Provision of walking aids as appropriate	
Sliding board transfers as appropriate (straight/downhill/uphill/car)	
Wheelchair skills as appropriate	
Pressure lifts as appropriate	
Upper limb strengthening work	

During and post treatment (depending on spinal stability)

- Education, information and support.
- Improve muscle power/strength.
- Facilitate progression from flat bed rest to 60° position.
- Facilitate bed mobility and transfer out of bed.
- Improve sitting/standing balance.
- Facilitate independent transfers where possible with the use of equipment if necessary.
- Assessment of home and provision of equipment.
- Gait re-education.
- Progression of functional activity to maximise independence.
- Educate regarding the use of a wheelchair if necessary.
- Encourage independence in activities of daily living (ADLs).
- Facilitate management of anxiety, relaxation.
- Educate and support regarding fatigue management and pacing of activities.
- Education and support regarding long-term use of collar/brace if required.
- Patients with MSCC require ongoing support and rehabilitation following their initial inpatient programme.
- For those patients who retain or regain mobility they will require follow up to aim to progress this further and to enable physiotherapists in the community setting to be aware of these patients in case of deterioration or recurrence.
- For wheelchair-bound patients they will need monitoring to maintain transfer and bed mobility abilities and to maintain ROM and upper limb strength.
- For patients who are less well and may be transferred to hospice services, they should have access to physiotherapy for rehabilitation to maintain quality of life in whatever way is appropriate for each individual patient.
- It is essential that physiotherapists in the acute setting refer this group of patients on to community teams to ensure continuity of care and maximal opportunity for functional and quality of life improvement or maintenance.
- It is imperative to monitor for signs of deterioration even in the rehabilitation phase as it

could be an indicator of compression at another level of spinal instability.

- Therefore, ongoing assessment is an essential part of the intervention stage.

Please refer to the NICE Malignant spinal cord compression guidelines (2008) for further information. A flowchart for decisions about the timing and safety of mobilisation is shown in Figure 12.1.

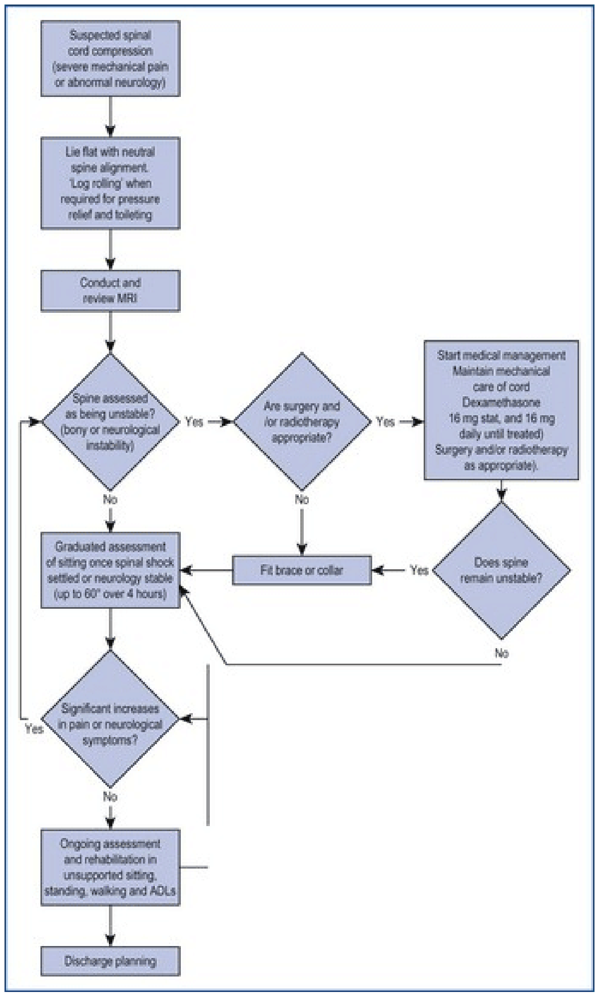

Figure 12.1 Flow chart for decisions about the timing and safety of mobilisation once MSCC suspected.

Brain and central nervous system tumours

- There are two main types of brain tumour, primary and secondary (metastatic).
- They are not common, accounting for less than 2% of all cancer diagnoses in the UK.
- Primary brain tumours are those which arise in the brain itself and secondary

(metastatic) brain tumours are the result of spread of disease from another site.

- Patients can present with a variety of symptoms dependent on the type, location and nature of the tumour. They also have the potential to change very quickly, particularly the high-grade primary brain tumours.
- Treatment for a patient with a brain or central nervous system tumour will focus on the impairments found during the assessment process, in the same way as for a patient with a CVA or spinal cord injury for example.
- The main difference will be to consider the levels of fatigue or pain that the patient may be experiencing, as well as the psychological impact of the diagnosis.
- Dependent on your assessment findings, the actual treatments will be similar to those used in any neurological condition and may include:
    - Proprioceptive rehabilitation
    - Sitting and standing balance rehabilitation
    - Gait re-education
    - Strengthening programmes
    - Transfer practice including lying to sitting, sit to stand or alternative transfers
    - Wheelchair mobility
    - Encouraging independence in functional activities and ADLs
    - Assisting the patient in returning to vocational activities and hobbies.

Plexopathy

- Tumour infiltration or as a result of disease progression and radiation injury are the most common causes of plexopathy in oncology and palliative care (Reddy 2006).
- Symptoms include pain, loss of motor control, sensory deficits and an overall deterioration in function.
- Treatments should be based on the findings of the assessment.
- While pain management is usually the most urgent symptom to be addressed, it may be appropriate to use range of movement exercises/stretches, postural correction, advice on skincare and splinting to promote comfort and minimise further deterioration.

Peripheral neuropathy

- In people with cancer, peripheral neuropathy is usually caused by damage to nerves from surgery, radiation treatment, or chemotherapy.
- It can also be caused by a tumour pressing on or penetrating a nerve.
- Chemotherapy-induced peripheral neuropathy as a result of neurotoxicity is a complication most commonly associated with the cytotoxic drugs vinca alkaloids, platinum-based compounds and taxols and the degree of reversibility is variable.
- Treatment should be focused on the relief of pain, strengthening weak muscles, facilitating movement, maximising function and independence and preventing further

complications.

- It may be necessary to provide assistive devices and adaptive equipment to support the patient's independence.
- It is important to highlight to the patient the potential safety risks associated with sensory dysfunction.

Progressive neurological conditions

- Many patients with progressive neurological conditions will have palliative care needs, most commonly those diagnosed with more aggressive conditions such as motor neuron disease (MND), multiple systems atrophy (MSA) and progressive supranuclear palsy (PSP).
- However, patients with other conditions such as multiple sclerosis and Parkinson's disease should also access palliative care services towards the end of their disease process or if there are complex symptom management issues.
- Treatment will be based on the findings of the physiotherapy assessment but should be based on goals set with the patient and focus on function.
- It is important to consider fatigue management and pacing with this group of patients and educate them about the balance between activity and rest.
- With many patients with aggressive neurological conditions, the physiotherapist should educate the patient that functional activities can be considered part of their exercise routine and that they should not be doing traditional exercise programmes at the expense of being able to function.
- It is also important to consider liaison with the acute or community sector regarding this group of patients as they will often have been receiving input from these services prior to referral to palliative care.

MND

- MND is a progressive neurodegenerative disease that affects the upper and lower motor neurons leading to weakness and wasting of muscle, loss of mobility and difficulties with speech, swallowing and breathing.
- MND has an incidence of 2 per 100 000.
- It is important for the patient to understand the nature of the disease and that the affected muscles cannot be strengthened.
- This must be balanced by providing positive information regarding using equipment to compensate and simple exercises to maintain remaining strength as much as possible.
- Patients should always be advised on a stretching regime to avoid muscle and joint stiffness.
- Mobility will often be affected at some stage of the disease and walking aids may not be useful if hand function is poor.

- Therefore, the physiotherapist will have to be adaptable and often inventive to maintain a patient's mobility for as long as possible and close liaison with colleagues, particularly the occupational therapist, will be vital.
- Respiratory management will often be key, including teaching deep breathing exercises and assisted cough techniques.
- It may also be appropriate to provide orthotics and splinting, such as orthoses for foot drop and neck collars.

MSA

- MSA is a progressive neurological condition caused by degeneration of neurons in the basal ganglia, cerebellum and brain stem causing problems with movement, balance and autonomic functions.
- MSA has an incidence of 5 per 100 000.
- Patients should be provided with a stretching regime and techniques or equipment to maintain mobility and movement.
- Patients will often have postural hypotension and the physiotherapist can provide education on how to manage this.
- As the condition progresses, respiratory and secretion management may become more important.

PSP

- PSP is a degenerative brain disease affecting eye movement, balance, mobility, speech and swallowing due to degeneration of neurons mainly in the basal ganglia and brainstem.
- PSP has an incidence of 5.3 per 100 000, although many patients are initially misdiagnosed with Parkinson's disease.
- Patients may require advice and equipment to maintain mobility and prevent falls.
- These patients will often have balance problems and a tendency to fall backwards.
- They will require a stretching regime and strength maintenance programme. Respiratory care will also be important.

Problems associated with presenting conditions

Pain

- Pain can be described as 'an unpleasant sensory or emotional experience associated with

actual or potential tissue damage, or described in terms of such damage' (IASP 1994).

- It is a complex phenomenon, which is the culmination of several factors, which may be physical or non-physical.
- The aim of treatment is to relieve pain, where possible, and to improve function and quality of life, using evidence-based techniques.
- A patient-centred approach which involves family and carers will facilitate goal setting and treatment planning.
- The physiotherapist can utilise a range of interventions, including therapeutic exercise, positioning, graded and purposeful activity, postural re-education, the use of appropriate moving and handling techniques, massage, soft tissue mobilisation, transcutaneous electrical nerve stimulation (TENS), the use of heat and cold packs, relaxation or coping strategies.
- In addition, cognitive behavioural therapy (CBT) techniques or acupuncture may be useful.
- The education of the patient, family, carers and other professionals is another important role that should not be overlooked.
- The management of pain requires a multidisciplinary approach and the physiotherapist must ensure that other members of the team are involved as necessary to help manage physical, psychological and spiritual aspects of pain.
- The concept of total pain is particularly important in the palliative care setting and emphasises the importance of a team approach, this concept is demonstrated in Figure 12.2.

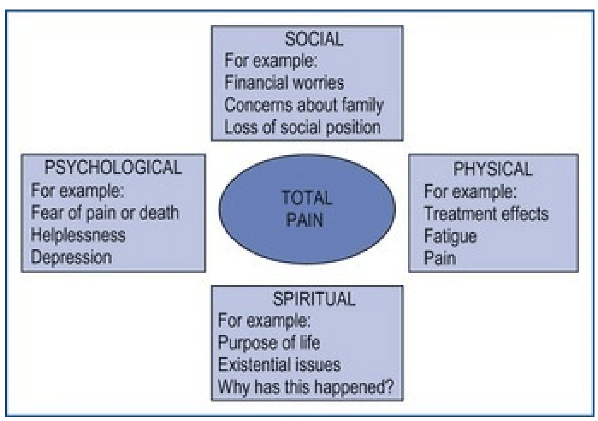

Figure 12.2 Total pain diagram.

Range of movement problems

- Decreased range of movement (ROM) at any joint in the body can occur as a result of surgery, side effects from treatment, deconditioning, the disease itself or a combination of many factors.

- Active ROM exercises can help build up or keep muscles as strong as possible. They can help keep joints flexible.
- Performing ROM exercises will facilitate blood flow to the joint area that is being exercised and may also help prevent blood clots such as DVT, especially if the patient is bed-bound.
- The key principles of exercise prescription include:
  - An individualised programme based on comprehensive assessment
  - Focusing on maintenance and/or improvement at relevant stages of the pathway
  - Concentrating on all aspects of fitness
  - Working towards goals identified by the patient
  - Regular reviews and reassessment.

Cording

- Lymphatic cording or axillary web syndrome (AWS) can appear after axillary node dissection with breast surgery (Tilley et al 2009).
- Cording refers to a ropelike structure that develops mainly under the axilla but can extend to involve the medial aspect of the ipsilateral arm down to the cubital fossa and even to the base of the thumb.
- These cords often typically reduce range of movement of the shoulder and can be painful for the individual, restricting activities of daily living.
- There is very little evidence to guide physiotherapists to the correct treatment, however a range of techniques have been suggested in a paper by Fourie and Robb (2009). This involves soft tissue massage with the patient in supine and with the affected arm at the limit of abduction.
- Stretches combined with passive and active exercise regime will also aid recovery. An example of cording is shown in Figure 12.3.
- Seromas can sometimes present following breast surgery and this is a collection of body fluid in the tissues.
- If there is a waterbed-like feature around the scar area the physiotherapists should refer the patient back to the breast care nurse for further assessment. The exercise regime and advice may need to be modified and adapted for the individual patient to avoid increasing pain levels.
- Following surgery connective tissue can often become tight and create a feeling of resistance, this can then reduce shoulder mobility.
- The aim of scar massage is to produce a strong, mobile scar (Rankin et al 2008). Once again, there is little evidence available for the correct treatment of scar massage. Fourie (2006) suggests that tissue mobilisation will encourage the alignment of collagen fibres along the lines of stress, thereby reducing the cross-link bonds responsible for the restriction of gliding planes. Massage is also thought to reduce scar hypersensitivity by stimulating regeneration of nerve endings.
- It is essential that throughout all treatment sessions the physiotherapist fully informs and

educates the patient as to the reasons for the specific intervention. This should ensure better patient compliance and speed up the recovery process.

Figure 12.3 Cording in the upper limb.

Summary

- Physiotherapy treatment in oncology and palliative care should be conducted on an individual basis and is dependent on a number of factors.
- Treatment approaches from other areas of physiotherapy practice, such as neurology and respiratory care, are often appropriate for this group of patients with the main consideration being the awareness of other factors specific to this specialty such as fatigue, pain and metastases.
- The psychological and spiritual factors of this group of patients also play a significant part in treatment planning and their importance should not be underestimated.

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Chapter 12

E-materials

Author profiles

Kate Baker BSc(Hons) MCSP

Kate qualified from Nottingham University School of Physiotherapy in 2003. After completing her junior rotations in Cardiff she worked as a senior physiotherapist in respiratory until the opportunity arose to apply for a full time position at Cardiff's regional cancer centre, Velindre Hospital. It was here she specialised in oncology and palliative care and she now currently leads the physiotherapy inpatient and outpatient team. Her areas of specialism lie in breast, head and neck cancers.

Kate is an executive member of the Association of Chartered Physiotherapists in Oncology and Palliative Care (ACPOPC) and is currently the treasurer. She has recently completed her foundation in acupuncture course and is enjoying the challenges and opportunities that this has brought.

Karen Livingstone GradDipPhys MCSP

Karen Livingstone is a clinical specialist physiotherapist working in Oncology and Palliative care for both St Ann's Hospice, Manchester, and the University Hospital of South Manchester.

She has extensive experience with over 14 years in rehabilitation in the cancer field and has been involved locally and nationally in lecturing and education. A published author in several book chapters she also is participating in national research in exercise, lymphoedema

and breast cancer and was runner up in the Princes Trust Integrated Health Awards for Fatigue Management in Cancer care.

Aileen McCartney MSc BSc(Hons) MCSP

Aileen is a specialist physiotherapist working at the Wisdom Hospice in Rochester, Kent. Aileen has been working in specialist palliative care for 5 years. She completed her MSc in Supportive and Palliative Care in 2010 focusing on rehabilitation for primary brain tumours. The results of her dissertation were published in Palliative Medicine in 2011.

Aileen is currently the education and research officer for the Association of Chartered Physiotherapists in Oncology and Palliative Care.

Siobhan O'Mahony PG Dip Health Services Management GradDipPhys MCSP

Siobhan O'Mahony qualified from the New University of Ulster at Jordanstown, Belfast in 1982. Having spent three and a half years rotating through the specialities as a junior physiotherapist, in the Royal Victoria Hospital, Belfast, she moved to Cork in 1986, and was

appointed to the position of senior physiotherapist in neurology and rehabilitation in Cork University Hospital.

In 1991, she took up a position at the Mercy Hospital, Cork, leaving in January 1998 to set up a new specialist palliative care physiotherapy service at Marymount Hospice in Cork, where she is currently the physiotherapy manager.

In 2004, she completed a post-graduate diploma in Health Services Management at the University of Limerick.

Having been a member of the Association of Chartered Physiotherapists in Oncology and Palliative Care (ACPOPC) since 1998, she joined the Executive Committee in 2007, and is currently the secretary.

Appendix 12.1 Normal blood values

Haematology

- Platelet count – normal range 150–00 × 10^9/L
- White blood cell count (WBC) – normal range 4–11 × 10^9/L
  - Basophil granulocytes – normal range <0.01–0.1 × 10^9/L
  - Eosinophil granulocytes – normal range 0.04–0.4 × 10^9/L
  - Lymphocytes – normal range 1.5–4.0 × 10^9/L
  - Monocytes – normal range 0.2–0.8 × 10^9/L
  - Neutrophil granulocytes – normal range 2.0–7.5 × 10^9/L

Biochemistry

- Potassium – normal range 3.5–5.0 mmol/L
- Sodium – normal range 135–146 mmol/L
- Urea – normal range 2.5–6.7 mmol/L/normal range 8–25 mg/dL

• Phosphate – normal range 0.8–1.5 mmol/L

Adapted from Kumar & Clark 2002.

Appendix 12.2 Red and yellow flags

Yellow flags	Red flags
Yellow flags are pyschosocial factors shown to be indicative of long-term chronicity and disability Negative coping strategies Poor self-efficacy beliefs Fear-avoidance behaviour Distress Attitude that back pain is harmful or potentially severely disabling Reduced activity levels An expectation that passive, rather than active, treatment will be beneficial A tendency to depression, low morale, and social withdrawalSocial or financial problems	Red flags are possible indicators of serious spinal pathology, urgent medical advice should be sought Constant pain, day and night Multiple nerve root pain Progressive neurological deficit Bladder or bowel dysfunction Reduced anal tone, saddle anaesthesia Unexplained weight loss Use of systemic steroids Thoracic pain Fever History of carcinoma Age of onset <20 years or >55 years Ill health or presence of other medical illness Disturbed gait

Reproduced from Samata J, Kendall J, Samanta A 2003 Chronic low back pain. British Medical Journal 326:535, with permission from BMJ Publishing Group Ltd.

Appendix 12.3 Outcome measures

Fatigue references

Fatigue Symptom Inventory (FSI)

Measures

The FSI is a 14-item measure that assesses the severity, frequency, and diurnal variation of fatigue, as well as its perceived interference with quality of life, resulting from fatigue over the previous 7 days.

Reference

Hann, D.M., Jacobsen, P.B., Azzarello, L.M., et al., 1998. Measurement of fatigue in cancer patients: Development and validation of the Fatigue Symptom Inventory. Quality of Life

Research 7, 301–310.

Brief Fatigue Inventory (BFI)

Measures

The Brief Fatigue Inventory (BFI) consists of nine questions rated on an 11-point, Likert scale. It measures the severity of fatigue, over the previous 24-hour period.

Reference

Mendoza, T.R., Wang, X.S., Cleeland, C.S., et al., 1999. The rapid assessment of fatigue severity in cancer patients: Use of the brief fatigue inventory. Cancer 85 (5), 1186–1196.

Cancer Fatigue Scale (CFS)

Measures

The CFS is a 15-item scale composed of three subscales (physical, affective and cognitive subscales).

Reference

Okuyama, T., Akechi, T., Kugaya, A., et al., 2000. Development and validation of the Cancer Fatigue Scale: a brief, three-dimensional, self-rating scale for assessment of fatigue in cancer patients. Journal of Pain and Symptom Management 19 (1), 5–14.

Revised Piper Fatigue Scale (RPFS)

Measures

The Revised Piper Fatigue Scale (RPFS) is a 22-item, 10-point self-report scale that measures overall fatigue and four fatigue dimensions: temporal, severity, affective, and sensory, which are currently being experienced.

Reference

Piper, B.F., Dibble, S.L., Dodd, M.J. et al., 1998. The revised Piper Fatigue Scale: psychometric evaluation in women with breast cancer. Oncology Nursing Forum 25 (4), 677–684.

Multi Dimensional Symptom Inventory (MDSI-SF)

Measures

The Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF) consists of 30 statements designed to assess the multidimensional nature of fatigue.

The MFSI-SF can be completed in a wide variety of settings in about 5 minutes and focuses on the subjective experience of fatigue. It evaluates the general, mental, and physical dimensions of fatigue, as well as levels of motivation and activity.

Reference

Stein, K.D., Jacobsen, P.B., Blanchard, C.M., Thors, C.T., 2004. Further validation of the Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF). Journal of Pain and Symptom Management 27, 14–23.

Functional Assessment of Cancer Therapy Fatigue (FACT-F)

Measures

FACT-F is a 5-point Likert scale. It contains 13 items, which attempt to identify the intensity of fatigue experienced, during the previous 7-day period.

Reference

Cella, D. 1997. The Functional Assessment of Cancer Therapy-Anemia (FACT-An) Scale: a new tool for the assessment of outcomes in cancer anemia and fatigue. Seminars in Hematology 34 (3 Suppl 2), 13–19. http://www.facit.org/

Schwartz Cancer Fatigue Scale (Revised)

Measures

Is a 6-item 5-point rating scale, which attempts to examine cancer related fatigue over both physical and perceptual dimensions and relates to fatigue experienced over the past 2–3 days

Reference

Strickland, O.L., Dilorio, C. (Eds), 2003. Swartz Cancer Fatigue Scale in measurement of nursing outcomes, second ed. Springer, London.

The Multidimensional Fatigue Inventory (MFI)

Measures

Multidimensional Fatigue inventory designed to measure fatigue. It covers the following dimensions: General Fatigue, Physical Fatigue, Mental Fatigue, Reduced Motivation and

Reduced Activity; is a 20-item self-report instrument.

Reference

Smets, E.M.A., Garssen, B., Bonke, B., De Haes, J.C.J.M., 1995. The multidimensional fatigue inventory (MFI) psychometric qualities of an instrument to assess fatigue. Journal of Psychosomatic Research 39 (3), 315–325.

Pain references

Visual analogue scale (VAS)

Measures

A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude, that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain.

Reference

Gould, D., Kelly, D., Goldstone, L., Gammon, J., 2001. Examining the validity of pressure ulcer risk assessment scales: developing and using illustrated patient simulations to collect the data. Visual Analogue Scale. Journal of Clinical Nursing 10 (5), 697–706.

Numerical Rating Scale

Measures

The Numerical Rating Scale is an 11-point, self-reporting scale. This scale which ranges from zero to 10, assigns a measurable number to the level of pain experienced. Zero represents no pain at all while 10 represents the worst imaginable pain.

Reference

Krebs, E.E., Carey, T.S., Weinberger, M., 2007. Accuracy of the Pain Numeric Rating Scale as a screening test in primary care. Journal of General Internal Medicine 22 (10), 1453–1458.

Anxiety and depression references

Hospital Anxiety and Depression Scale (HADS)

Measures

The Hospital Anxiety and Depression Scale (HADS) is a questionnaire that gives indications to the levels of depression and anxiety of a person.

Reference

Zigmond, A.S., Snaith, R.P., 1983. The Hospital Anxiety and Depression Scale. Acta Psychiatrica Scandinavica 67 (6), 361–370.

The Brief Edinburgh Depression Scale (BEDS)

Measures

This is a six-item, self-reporting scale, which is a brief and sensitive method of screening for depression in advanced cancer patients.

Reference

Lloyd-Williams, M., Shiels, C., Dowrick, C., 2006. The development of the Brief Edinburgh Depression Scale (BEDS) to screen for depression in patients with advanced cancer. Journal of Affective Disorders 99 (1–3), 259–264.

Body image references

The Body Image Quality of Life Inventory (BIQLI)

Measures

The Body Image Quality of Life Inventory (BIQLI) uses a 7-point response format ranging from very negative (−3) to very positive (+3) effects of body image on 19 life domains.

Reference

Cash, T.F., Fleming, E.C., 2002. The impact of body-image experiences: Development of the Body Image Quality of Life Inventory. International Journal of Eating Disorders 31, 455–460.

The Situational Inventory of Body-Image Dysphoria (SIBID)

Measures

The Situational Inventory of Body-Image Dysphoria (SIBID) is an assessment of the

frequency of negative body-image emotions across specific situational contexts. This inventory asks respondents how often they experience body-image dysphoria or distress in each of 48 identified situations – including both social and nonsocial contexts and activities related to exercising, grooming, eating, intimacy, physical self-focus, and appearance alterations. A short-form of the SIBID (SIBID-S) contains 20 items.

Reference

Cash, T.F., 2002. The Situational Inventory of Body-Image Dysphoria: Psychometric evidence and development of a short form. International Journal of Eating Disorders 32, 362–366.

The Body-Image States Scale (BISS)

Measures

The Body Image States Scale (BISS) is a six-item measure of individuals' evaluation and affect about their physical appearance at a particular moment in time.

Reference

Cash, T.F., Fleming, E.C., Alindogan, J., Steadman, L., Whitehead, A., 2002. Beyond body image as a trait: The development and validation of the Body Image States Scale. Eating Disorders: The Journal of Treatment and Prevention 10, 103–113.

Appendix 12.4 Common side effects from treatment

Surgery

All surgical procedures can have potential post operative risks of pain, wound infection, DVT, swelling, chest infection and fatigue. Long-term problems from oncological surgery may include neuropathic pain, lymphoedema, complex scarring, altered muscle function and body image issues, which may be more challenging to the newly qualified physiotherapist.

Chemotherapy

Chemotherapy treatment can be administered by a wide variety of methods and with different aims and outcomes. The type of drug, schedule of treatment and dosage is a careful balance against the both the expected outcome of treatment and potential side effects regardless whether the aim is for cure, disease control or quality of life. Tissues with the

highest proliferation rate are commonly affected by chemotherapy, i.e. mouth, digestive system, skin, hair, and bone marrow.

Mouth

Often starts 5–10 days after treatment cycle and can give sore or dry mouth, ulcers, increased risk of infections particularly fungal, e.g. thrush.

Digestive system

Nausea, vomiting, or diarrhoea may occur within a few hours of treatment or not occur for several days. Some chemotherapy can give heartburn or constipation.

Skin

Skin may become dry, discoloured, or more sensitive to sunlight and nail growth may be affected. Plantar palmar syndrome where hands and soles of feet become red, dry and painful is a complication of some drugs.

Hair

Some but not all drugs cause alopecia, usually within the first few weeks of treatment.

Blood and bone marrow

Chemotherapy commonly causes acute myelosuppression. Anaemia causes breathlessness, tiredness and muscle fatigue and may require transfusion, or red blood cell growth factors such as erythropoietin.

Leukopenia – a decrease in white cell count will mean the patient is more susceptible to infection. Neutropenia – a subtype of leukopenia – is a greater indicator of infection risk. It is vital that the patient and physiotherapist are aware of symptoms of infection (i.e. raised temperature, sore throat, cough, breathlessness, pain passing urine, or any redness or swelling such as round a central line); the patient must seek urgent medical advice. Infection left untreated can rapidly develop into septicaemia in these patients. Treatment involves regular injections of growth cell factors such as G-CSF (granulocyte colony-stimulating factor), which can in itself give bony pain.

Thrombocytopenia (low platelet count) will mean the patient bruises more easily and bleeds more than usual and may experience pain and swelling as a result. If the count is too low the patient may require a platelet transfusion.

Other more long-lasting side effects

Fatigue, sleep disturbance, infertility, peripheral neuropathy, pneumonitis, pulmonary fibrosis, liver or kidney dysfunction, cardiomyopathy or cardiac arrhythmias, haemorrhagic cystitis, tinnitus, psychological issues and body image concerns.

Steroids are used in chemotherapy for acute symptom relief but can give mood swings. Longer-term use can lead to osteoporosis, myopathies, diabetes, and Cushingoid symptoms.

Radiotherapy

Side effects will depend on the mode of treatment, dose and surface area treated.

Initial side effects

Fatigue is common, often starting within a week of treatment commencing, and can persist for weeks.

Skin will inflame initially but can become dry, scaly and itchy. Skin can break down (moist desquamation) and blisters can occur. This is more likely with sensitive skin recently traumatised, as in surgery or infection. Skin reactions usually settle within 2–4 weeks following treatment.

Other side effects are dependent on the area of the body treated:

- Skull and brain – alopecia, cerebral oedema, restlessness, irritability, headache, nausea.
- Head and neck – mucositis, destruction of salivary glands, taste changes, pharyngitis, oesophagitis.
- Chest/upper back – oesophagitis, pneumonitis, indigestion, nausea.
- Abdomen and lower back – nausea, vomiting, diarrhoea, cystitis, infertility.
- Flat bones – acute myelosuppression.

Longer-term side effects

Lung fibrosis, cardiac dysfunction, tissue fibrosis, lymphoedema.

Hormone therapies

Hormone therapies such as: anti-oestrogens; luteinising hormone releasing hormone agonists; oestrogen receptor down-regulators; aromatase inhibitors may result in hot flushes, dizziness, mood swings, nausea, headaches, arthralgia, increased risk of thrombosis, retinopathy, osteoporosis, ca uterus in women and gynaecomastia in men. Immunosuppressant therapies, angiogenesis and gene therapies are relatively new therapies aimed at reducing blood flow and stimulating the immune system.Side effects include immunodeficiency, hypertension and infections.

Appendix 12.5 Neurological assessment

Assessment of the upper limb

Nerve root	Dermatomes	Myotomes	Reflex
C1	Superior head	Breathing	
C2	External occipital	Cervical flexion	
C3	Neck	Cervical side bending	
C4	Traps/lateral neck	Scapula elevation	
C5	Lateral arm/deltoid	Shoulder abduction	Biceps
C6	Lateral forearm/ thumb/index finger	Elbow flexion and wrist extension	Brachioradialis
C7	Middle finger	Elbow extension/ wrist flexion/finger extension	Triceps
C8	4th and 5th finger/ medial forearm	Finger flexion and thumb abduction	Triceps
T1	Medial arm/axilla	Finger abduction and finger adduction	

Assessment of the lower limb

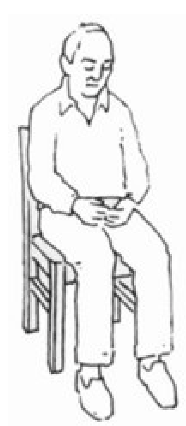
Nerve root	Dermatomes	Myotomes	Reflex
L1	Groin	Hip flexion	
L2	Thigh	Hip flexion	
L3	Superior patella	Knee extension	
L4	Medial tibia/medial arch	Dorsiflexion and inversion	Patellar tendon
L5	Dorsal and lateral foot	Big toe extension	
S1	Plantar aspect of foot	Ankle plantarflexion	Achilles
S2	Posterior thigh	Knee flexion	
Plantar response	+ve = upgoing 1st toes and abducting toes 2–5		

Appendix 12.6 Common primary brain tumours

Tumour	Grade	Prognosis
Anaplastic astrocytoma	III	5 year survival 10%
Glioblastoma multiforme	IV	11 months from diagnosis 5 year survival 6%
Anaplastic oligodendroglioma	III	5 year survival 30–38%
Anaplastic ependymoma	III	2–3 year survival on average 5 year survival 10–50%
Low-grade meningioma	II	5 year survival >80%
High-grade meningioma	III	5 year survival <60%
Acoustic neuroma	I/II	Usually curable
Pituitary tumours	II	5 year survival >82%

Cancer Research UK, 2008.

Appendix 12.7 Positions of ease for breathlessness



Case Study 12.1

Background

- Ms K was a 60-year-old lady who was admitted to a cancer centre with suspected metastatic spinal cord compression from her GP in January.
- She had a 3/12 history of worsening lower limb weakness with a recent history of two falls.
- She also had a 3/7 history of urinary retention.
- An MRI scan confirmed a cord compression at T8.
- On admission she was commenced on high-dose steroids and advised to remain on strict flat bed best.
- She was planned for radiotherapy, five fractions over a 5-day period.
- Radiotherapy however didn't commence at this time as the physiotherapists assessed her neurology, sat Ms K up in bed from 0–60° over a gradual period while monitoring for changes in symptoms.
- Ms K had increasing pain and worsening right leg hip flexion indicating spinal instability.
- Surgical opinion was sought and Ms K was transferred to a local district general hospital under an orthopaedic team for decompression and debulking of T9.
- Ms K returned to the cancer centre post operatively for her five fractions of radiotherapy.
- From the baseline neurological assessment and throughout treatment Ms K had significantly reduced lower limb power and was therefore transferred to a rehabilitation unit from the cancer centre 3 days after finishing radiotherapy.

Previous medical history

- She had a history of left breast carcinoma 9 years ago and a recurrence in her right breast 4 years ago.
- Ms K had no living relatives but had a few close friends and lived alone in a single-storey

cottage.
- She was fiercely independent, drove a car and carried out her own activities of daily living.

Assessment

- Ms K was very anxious as she had poor sitting balance, both lower limbs were weak. Muscle power of right and left hip flexors and knee extensors were Oxford grading 3+/5 with full power at both ankle joints.
- Her sensory level was T8.
- Her joint position was assessed as normal.
- She was fully aware of the nature of her disease, but was persistent in the belief that she would walk again.
- She had a urinary catheter in situ, as she had no sphincter control.

Treatment

- Physiotherapy treatment commenced with chest care, active assisted movements to her lower limbs and arm-strengthening exercises.
- As Ms K identified that her quality of life was intractably linked to her independence, achieving wheelchair mobility was her primary goal.
- She progressed to active-assisted movements of her lower limbs and standing in the parallel bars.
- Improvements in hip extension and trunk control allowed Ms K to take a few steps, which helped her to regain her locus of control.
- Following a home visit with Ms K, a physiotherapist from the rehabilitation centre and a community occupational therapist, she was discharged from the centre in July.
- Weekly physiotherapy sessions were arranged at the acute hospital and frequent progress reports were made to the palliative care team.
- Ms K continued to attend the hospice day care centre three times a week for ongoing monitoring, support and socialising.
- She was also reviewed by the orthopaedics who were pleased with her progress and discharged her from their care.
- By November, Ms K was walking with a Zimmer frame and by December, she was mobile with a stick.
- Initially, the multidisciplinary team felt that it was highly unlikely that Ms K would walk again, yet Ms K managed to live independently at home and continues to do so.
- Continually reassessing the patient, looking for opportunities for improvement and renegotiating goals are an essential part of physiotherapy treatment planning.
- For many patients, maintenance of hope is paramount. To quote Ms K ‘If I lose hope, I lose the battle’.

Case Study 12.2

Background

- Mrs C was a 45-year-old lady who was referred for outpatient physiotherapy from her GP with pain, stiffness and tightness affecting her left chest, shoulder and arm.
- She had a previous diagnosis of invasive ductal carcinoma of the left breast, which was initially treated twelve months previously, with a wide local incision (WLE) and sentinel node biopsy (SNB) whereby two lymph nodes were removed and found to be affected.
- The tumour was identified as grade III aggressive, and strongly oestrogen receptor positive.
- Three weeks following her initial surgery she went on to have a left axillary node clearance (ANC) of 22 nodes one of which was found to be affected by the cancer.
- Her surgery was followed by 6 cycles of intravenous chemotherapy which she tolerated reasonably well and 15 fractions of radiotherapy to the left chest and axilla which was completed 4 months prior to accessing physiotherapy.
- Mrs C had been started on Tamoxifen hormone therapy on completion of her chemotherapy.

Previous medical history

- Mrs C had had 2 previous caesarean sections but had otherwise had previous good health.
- She was married with 2 children, both girls under the age of 10, and was a part-time teaching assistant.

Assessment

- Mrs C presented with reduced left shoulder mobility particularly flexion, abduction and external rotation.
- She had two well-healed scars, one superior to the left nipple and the other in the left axilla which appeared to be adhered and there was tight clavipectoral fascia.
- There were visible spot tattoos encircling the radiotherapy field.
- Posture was affected with protraction of the left scapula and associated left trapezius spasm.
- Mrs C reported she had good range of movement after her initial surgery but had first noticed stiffness in her shoulder following the ANC.
- She had felt increasing tightness in her left chest over the last 2 months and was having trouble finding a comfortable bra.
- She expressed fears for the future, of recurrence for herself and for her children's risk of developing breast cancer.

Treatment

- The aims of treatment were to
  - Mobilise the shoulder
  - Improve the scar and achieve good extensibility of tight fascia
  - Re-educate posture
  - Teach good skin care and lymphoedema prevention
  - Liaise with the breast care nurse for support with fears for the future and body image concerns.
- Mrs C attended for five sessions and was taught a home exercise programme, which included progressive shoulder mobilisation and stretching exercises and self scar massage.
- This also included a skin care programme applying a cream to the affected arm and shoulder in a manner to support the lymphatic system.
- Her treatment programme included mobilisation of the shoulder, myofascial release, postural exercises and lymphoedema prevention advice.
- Importantly, during the treatment sessions she was also able to identify areas of concern with body image, day and night sweating and her fears about the cancer returning.
- She was encouraged to talk to her oncology team about her concerns of recurrence, and possible risks for her daughters and an appointment with her breast care nurse was facilitated to address menopausal symptoms and bra fitting.
- On discharge Mrs C had regained her range of movement and was much more confident.
- She was reassured regarding future activity and planned to join a local combined Pilates and Yoga class.

Case Study 12.3

Background

- Mr J was a 45-year-old man recently diagnosed with motor neuron disease (MND). He was married with three young children.
- He had worked as an accountant, but over the previous 2 years his presenting symptoms of upper limb weakness and speech difficulties had meant he had to give work up.
- He had been seeing a number of neurologists over these 2 years until the diagnosis of MND was finally made.
- Mr J was referred to the specialist palliative care service in September for management of symptoms and psychosocial support for him and his family.

Previous medical history

- He had no previous history of illness and in fact had been a very active man, taking part in competitive running.

Assessment

- Mr J and his wife were devastated by the diagnosis although expressed relief in some ways that at least they now had a named condition.
- Mr J had significant upper limb weakness, worse distally than proximally with no active movement in his fingers, thumb or wrists, grade 1 power in his biceps and triceps and grade 2 power in his shoulder.
- Therefore he had no real functional use of his upper limbs.
- This meant he was completely reliant on his wife for assistance with all daily activities, something they were both finding difficult to cope with.
- Mr J remained mobile and the strength in his lower limbs was normal at this stage. Mr J had a speech impairment although communication was still possible and his speech was understandable.
- Mr J was already seeing the speech and language therapist attached to the palliative care service.

Treatment

- Physiotherapy treatment commenced with teaching Mrs J how to do passive and active assisted movements for Mr J's upper limbs.
- Advice was also offered on positioning and support for his limbs.
- Due to discomfort when walking it was decided to also trial shoulder supports for both arms to reduce the shoulder subluxation due to weakness and muscle loss. Preventative advice was also given regarding respiratory care through deep breathing exercises.
- A referral was made to the occupational therapist for support for daily activities and equipment provision.
- By December Mr J's speech had deteriorated further and he was having difficulty managing his secretions.
- Alongside the speech therapist, advice was given on secretion clearance techniques and other methods to manage secretions.
- At this time Mr J had also begun to experience some lower limb weakness although he was still mobile.
- Mr J's treatment was managed as part of a multidisciplinary team, with his management plan discussed monthly at the MND meeting.
- He had regular input from the consultant, clinical nurse specialist, physiotherapist, occupational therapist and speech and language therapist.
- The whole family had regular support from a social worker and a welfare advice officer.
- The children also saw a social worker individually and through this were able to express

their feelings and communicate well with their father.

- Through this Mr J was also able to make memory boxes for each of his children. This multidisciplinary approach was essential in managing a rapidly changing condition that impacted on every aspect of Mr J's life.
- In February Mr J developed a chest infection and was admitted to the acute hospital for treatment.
- At this stage it became clear that he was in the final stages of his illness and he was transferred to the inpatient unit at the hospice where he had always wanted to die.
- At this stage physiotherapy input was supportive, giving advice on positioning Mr J in bed to reduce his discomfort, gentle breathing and relaxation exercises when appropriate and support for his family.

Three days after arriving at the hospice Mr J died with his family around him.

Chapter 12 Multiple choice questions

1. What are the most prevalent types of cancer in the UK?
   a). Breast, bowel, lung and prostate cancer
   b). Non-Hodgkin's lymphoma, breast, ovarian and pancreas cancer
   c). Multiple myeloma, stomach, kidney and bladder cancer
   d). Lung, oesophagus, brain and liver cancer
2. The most common side effects of radiotherapy are ...
   a). Pain, depression and heart problems
   b). Hallucinations, insomnia and pain
   c). Constipation, increase in appetite and hair loss
   d). Skin problems, loss of appetite and fatigue
3. How are brain tumours classified and which is the most severe?
   a). Grades I–VI with Grade I being most severe
   b). Grades I–IV with Grade IV being most severe
   c). Level I–X with Level X being most severe
   d). Level I–V with Level I being most severe
4. A 70-year-old male presents with severe, constant low back pain, difficulty passing urine and numbness in his legs. He has a history of prostate cancer. What would you suspect?
   a). Bladder infection
   b). Return of prostate cancer
   c). Secondary bladder cancer
   d). Spinal cord compression
5. You are asked to rehabilitate a breathless patient with lung cancer. His mobility is limited only by SOBOE. What do you do?
   a). Discharge the patient; there is nothing you can do for this type of breathlessness
   b). Liaise with the OTs to ensure the patient is discharged to single-level living with commode downstairs
   c). Verbally encourage the patient to 'get through the problem'

d). Use pacing and positions of ease to optimise his breathing

6. A lady has primary breast cancer and presents to the ward with LBP. The nurses ask you to assess her mobility. What do you do?
   a). Complete lumbar spine assessment including accessory movements
   b). Complete your data gathering including site of spread, then seek senior support
   c). Complete full mobility assessment
   d). Deem referral inappropriate, refer to outpatients and discharge
7. When would you consider a patient post peripheral blood stem cell transplant too thrombocytopenic for physiotherapy intervention?
   a). Platelets >100 and Hb >8
   b). Platelets <50 and Hb <8
   c). Platelets >50 and Hb >8
   d). There is no unsafe limit
8. What are the most common types of cancer that can lead to spinal cord compression?
   a). Brain, bowel and kidney cancer
   b). Stomach, liver and ovarian cancer
   c). Prostate, lung and breast cancer
   d). Malignant melanoma, prostate and bowel cancer
9. Chemotherapy works best for ...
   a). Breast, lung and bowel cancer
   b). Myeloma, lymphoma, leukaemia and testicular cancer
   c). Oesophagus, prostate and liver cancer
   d). Lymphoma, lung, breast and bowel cancer
10. A 55-year-old lady with brainstem glioma has been admitted for a 6-week course of radiotherapy. What side effects of radiotherapy are most likely to impact on your physiotherapy treatment?
    a). Fatigue
    b). Double vision
    c). Nausea and vomiting
    d). All of the above
11. A patient you have been treating for several weeks asks 'Am I dying?' Do you:
    a). Say 'no' and change the subject
    b). Reassure them the doctors are doing everything they can
    c). Say 'I don't know. Would you like me to ask someone to come and talk to you about this'
    d). Reply with a question to establish their understanding of their disease or their reason for asking
12. A patient with end-stage heart failure is referred to you for assessment; she is likely to die within the next week but wants to try to improve her mobility. What do you do?
    a). Tell nursing staff the referral is inappropriate and discharge
    b). Assess the patient but tell her there is nothing you can offer at this stage
    c). Assess the patient to identify her goals and together make a realistic plan for

physiotherapy intervention

d). Assess the patient and immediately instigate a daily mobility programme with exercise programme

13. What are the four aspects of the Total Pain Model?
    a). Financial, social, medical and spiritual
    b). Spiritual, physical, psychological and social
    c). Emotional, physical, financial and medical
    d). Physical, medical, social and spiritual
14. Which of these non-malignant conditions may be most appropriate for palliative care
    a). Motor neuron disease
    b). End-stage respiratory disease
    c). End-stage renal failure
    d). All of the above
15. Goal setting in palliative care should be
    a). Continually reviewed to effect a speedy discharge
    b). Continually reviewed against a background of the patient's changing condition
    c). Continually reviewed to make best use of available resources
    d). Continually reviewed by the medical team
16. Malignant spinal cord compression is most commonly associated with
    a). The cervical spine
    b). The thoracic spine
    c). The lumbar spine
    d). The sacral spine
17. Brachial plexopathy is most commonly associated with
    a). Lymphoma, breast and lung tumours
    b). Primary brain tumours
    c). Melanoma
    d). Sarcoma
18. The most common presenting symptom of brachial plexopathy is
    a). Weakness
    b). Allodynia
    c). Pain
    d). Pruritis
19. Bone metastases are most commonly associated with which cancers
    a). Pancreatic, renal, lung and kidney
    b). Breast, prostate, renal and pancreatic
    c). Breast, prostate, lung and kidney
    d). Lung, renal, pancreatic and breast
20. In fatigue management, what are the five P's of energy conservation?
    a). Posture, perseverance, plan, permission and practice
    b). Perseverance, posture, permission, pace and prioritise
    c). Plan, pace, perseverance, practice and permission

d). Plan, pace, prioritise, posture and permission

Multiple choice answers

1. a)
2. d)
3. b)
4. d)
5. d)
6. b)
7. b)
8. c)
9. b)
10. d)
11. d)
12. c)
13. b)
14. d)
15. b)
16. b)
17. a)
18. c)
19. c)
20. d)

Chapter 13

Pain Management

Once assessment has established the type of pain the patient is experiencing, priorities and interventions can be determined and directed at those factors contributing to pain, distress, disability or reduced quality of life.

Acute pain relief

> *Despite substantial advances in pain research in recent decades, inadequate acute pain control is still more the rule than the exception. Numerous studies show that fewer than half of postoperative patients receive adequate pain relief … The 2010–2011 campaign, with its theme of 'Anticipate, Assess, Alleviate', aims to improve acute pain management worldwide.*
> IASP 2010 *Global Year Against Acute Pain.*

Drug therapy

Patients who have been injured or undergone surgery will have nociceptive input that requires analgesia. Successfully treating acute pain markedly reduces the likelihood of chronic pain developing. While adequate comparison trials between drug and non-drug methods have been neither supported by drug companies nor performed, experienced therapists know that non-drug methods may be as effective as analgesics, and that *both* should always be used.

Therapeutically effective analgesia should also be given in the form that is most likely to ensure maximum placebo effect. Analgesia must satisfy the brain's desire for an adequate treatment that will allow it to reduce the synaptic strength and connectivity within the CNS supporting the pain state (Wall 1999, Roche 2002).

Many physiotherapists have limited or no prescribing rights but they can support the health care team in ensuring that:

- Prescribing, giving and timing of adequate analgesia facilitates effective physical treatment. Analgesia should be at a level where there is no pain or a level of discomfort that the patient considers manageable.
- Patients with pain on movement following a period of inactivity and tissue stasis receive adequate analgesia prior to initiating the movement. Linking aversive levels of pain to movement can mean anticipation and fear of pain becomes more powerful than the pain

itself; preventing patients fully participating in treatment that itself reduces pain.

- Those who regularly take analgesia or other psychoactive drugs like alcohol may require higher doses. If this is suspected during activity, the physiotherapist can discuss this with the patient's prescriber.
- Care is taken that patients do not take doses that put kidney or liver function at risk. Before requesting postoperative non-steroidal anti-inflammatory drugs (NSAIDs) or larger doses of opiates check creatinine levels and look closely at the past medical history (PMH).
- Great care is taken with the elderly. Do not use NSAIDs or larger doses of opiates with the over 70s. Relatively moderate doses of opiates or accumulating levels over time can precipitate acute confusion and permanent deterioration in memory and function, particularly in those who are not accustomed to them.
- Local and epidural anaesthetic blocks are used to help reduce or stop local pain. They enable rehabilitation despite severe pain that is less responsive to analgesics, or when a patient's condition means therapeutic doses cannot be tolerated or are unsafe. New products including improved local anaesthetic patches and creams are becoming available all the time. Experienced staff may be able to advise you on what is available for your patients.
- Patients who don't like taking 'drugs' and normally take as little as possible are encouraged not to let analgesics wear off before the next dose. Remind them: taking medication regularly in the early stages means taking less in the future; simple analgesics, even morphine, do little harm in therapeutic doses.
- If you suspect that patients are taking more than prescribed due to forgetfulness or multiple sources, e.g. over the counter and alcohol as well as prescribed, they must be warned of the risks, non-drug methods promoted, fears (which often encourage analgesia use) addressed, and the physician informed.
- Ensure paracetamol is given as well as opioid-based medication; it is a powerful painkiller. As it is an over-the-counter analgesia, patients often believe it is 'mild', ineffective for more severe problems. This is not the case. Care is needed to ensure the maximum daily dose is not exceeded. Care is also required for patients who take paracetamol and any analgesia on a regular and prolonged basis since these are associated with chronic medication-withdrawal headaches.

Non-drug therapy

For all patients, whether inpatient or at home, the use of non-drug methods to reduce pain and its impact, in addition to medication, should be promoted. See Box 13.1.

Box 13.1 Non-drug methods to reduce pain and its impact

- Cold or heat for injuries. Heat can be used for muscle spasm, but not in the presence of a significant healing response or inflammation. Sometimes both heat and cold can be used

alternately
- Activities and conversations as distraction
- Friends, neighbours and relatives can offer reminders to limit exertion and to encourage moderate activity. The meaning of 'appropriate rest' must be understood so they don't assume it means doing nothing
- Acupuncture, may provide a powerful placebo effect for many patients. It can be worth exploring for the individual patient as an aid to rehabilitation and to assist night-time sleep
- Keep the 'pain gates' closed as far as possible:
  - Avoiding keeping still for long periods including night times (a full bladder has its uses!)
  - Use brief, rhythmical, relaxed movement of the muscles and joints of the affected part between short rest periods, e.g.:
    - Rocking in a rocking chair
    - Pendular movements of the arm, leg, hand or foot
    - Shoulder rolling; 'nodding dog' head movement
    - Gentle trunk rotation, hip hitching, stomach pull-ins
- If a part is too painful to move initially, advise on movements of other parts of the body before the most painful area, e.g. move the neck, shoulders and hips before the painful back
- Don't prevent weight-bearing unless there is very good reason to. If paced, it reduces pain and swelling and increases confidence. Encourage smooth, gentle, relaxed walking for legs and spine, as 'limp-free' as possible; gentle pushing movements for arms. Any walking aids should have a clear wean-off programme initiated from the start to reduce future pain and disability (plus minimising loss of confidence and dependence)

Physical activity: our most potent pain reducer and aid to rehabilitation

In addition to acting on the musculoskeletal, cardiovascular, respiratory and endocrine systems, physical activity and function have an impact on the brain. Input and output to the sensory and motor cortex are sustained so that the representation of peripheral parts in the cortices is kept as normal as possible. The CNS production of pain-reducing endorphins and antidepressant monoamines is enhanced and production and impact of glucocorticoid stress hormones reduced (Duclos et al 2003). Exercise may also act as a coping mechanism and help divert patients away from negative thoughts (Box 13.2).

Box 13.2 Physical activity after surgery or injury

advice you can give to your patient

Immediately

- Calm the pain down using 'pain gate-closing' activities 'little and often' with frequent short rests for 2 days
- Reduce overall activity and rest between activities, particularly for the first 2 days, avoiding complete rest
- Relax muscles when resting and whilst moving
- Walking is the best pain-reliever, breathing exercise and basic function to support the body in recovery
- If a part feels strangely painful, weird or numb, keep touching, stroking, pressing and massaging around the area. Watch yourself doing this; it assists the brain to keep 'in touch' with the body

After 2 days

Gradually move and do more to:

- Improve the circulation and aid healing
    - Strengthen and stretch healing tissues
    - Don't avoid normal daily activities – do tiny amounts if it's very painful initially
    - Work other parts of the body including heart and lungs as normal; focus on weight bearing
- Reduce muscle spasm, checking muscles are as relaxed as possible when in use. If muscle tension/spasm builds, take more frequent rest breaks
- Don't let chronic pain develop: move regularly, use and touch the injured part, building up to normal use, including a graded return to work or simulated work activities

From 2 weeks

- Prevent scar tissue tightening: massage external scars; stretch internal scars
- Continue to build activity. Remodelling processes respond to use: challenge them in the chronic healing stages
- Keep searching for physical concerns/fears as a result of your injury or its context: face them in a gradual and graded way with guidance

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Understanding and accepting or making judgements?

Pain may be unexpectedly more or less than expected for the injury experienced, and can wax and wane over time in ways that may not always be predictable (Cronje and Williamson 2006). Patients can find this disconcerting and concerning, causing them to doubt what the health professional tells them about their condition. Health professionals have a tendency to underestimate or misidentify patients' pain, some assume that if a patient is smiling they can't be in pain (Kappesser and Williams 2002). Is this accurate, fair or reasonable?

Measurement of pain alone does not indicate understanding, belief or empathy. Patients frequently report feeling they have not been believed. To say 'it can't be that bad' demonstrates a complete lack of understanding of:

- Pain and its behaviour.
- Other contributing factors such as fear or frustration.

Saying to a patient that 'it can't be that bad' can lead to a downward spiral of the patient trying to demonstrate how strong their pain is, coupled with stronger beliefs by the health professional that they are making a fuss. This results in a breakdown in therapeutic alliance.

A more helpful alternative may be to take the opportunity to consider 'I wonder why this patient is behaving like that; why I find this unexpected?'

Physiotherapists are in a unique position since they treat patients in pain in different contexts to other professionals and may therefore pick up factors about patients' pain that others do not. They are also trained in pain neurophysiology and pain management, so can be a good ally for patients in providing explanations about their pain. They can alert other health professionals when further investigation is required or an exploration of patients' past experiences or home situations are needed.

What should/could I do when the patient has red flags?

These are indicators of serious pathology, and the appropriate medical practitioner should be informed as a matter of urgency. Remember that the patient still has pain and requires management for this. They can still be given advice on pain relief and gentle mobilisation.

Hypersensitivity pain states masquerading as acute pain: have faith!

The difference between acute (nociceptive) pain associated with injury or disease and overuse symptoms can be difficult for patients to understand, particularly in patients experiencing episodic neuropathic pain conditions, e.g. low back pain (LBP) or headaches. The tendency to central hypersensitivity will make unaccustomed use symptoms more painful. The presentation of masquerading conditions can be puzzling to lay people, making them fearful

of their tissue strength and of instigating appropriate pain management involving movement.

The way that society has publicly managed pain in the past is partly responsible for the development of these behaviours. While professional practice is improving in this area, patients are all too often given inappropriate walking aids for simple sprains, or supports for the back/neck. When aids are provided patients need to know how and when to wean themselves from these.

Patients need to understand the appropriate management of acute pain and chronic hypersensitivity. With no signs of tissue damage, frequent movements, interspersed with brief rest periods can be instigated immediately. Patients need evidence of the strength of their tissues and to appreciate that pain is not a sign of damage: helping them learn from their own experience is vital.

Preventing chronic pain and disability

Addressing key risk factors: flags

Shaw and colleagues' (2005) early risk factors help focus the treatment plan for yellow flags.

Patients with increased pain affecting sleep despite analgesia

All appropriate methods of attaining pain relief, both drug and non-drug therapies should be discussed with such patients. Benzodiazepines should only be used temporarily: they prevent sleep beyond 2 weeks' use.

Practical advice on managing pain at night may help, e.g. maintenance of through-night analgesia, position changes, and movement in or out of bed. Advice on using pillows to support fractures/injuries can be invaluable. Nerve blocks to help achieve sleep should be supported where needed.

What a patient does or doesn't do in the daytime will influence the night. Daytime naps, particularly beyond lunchtime/early afternoon are disruptive to the body clock and sleep. Equally, being overactive in the daytime can increase pain, so that when the body finally rests, sleep will be prevented. Crawford (http://www.painconcern.org.uk/2011/04/leaflets/a-good-nights-sleep) gives good advice on sleep hygiene.

Belief that pain is harmful or potentially disabling

Beliefs about pain can influence behaviour and inhibit healing and recovery, e.g. the assumption that the severity of pain relates to the severity of injury. This can escalate to avoiding painful movements and reduced function on the assumption that activity will inhibit healing or recovery, when in fact the opposite is usually the case.

Fear of pain is more disabling than the pain itself (Waddell 1998, Crombez et al 1999).

Information and patient experience are important factors for reducing fear. Information that may help patients includes:

- The time limit of inflammation for their particular injury (maximum 7 days) and the expected healing process (maximum 3 months). Don't mistake hypersensitivity for inflammation; pain doesn't mean it hasn't healed.
- An explanation of acute and chronic pain: input about the original damage is altered by central processing; how hypersensitivity develops (http://www.ppip.org.uk/viewdocuments.aspx; Butler and Moseley 2003).
- An explanation of diagnoses such as 'degeneration', 'black or bulging discs' (normal age-related changes) set in the context of pain-free populations with identical findings.
- The fact that epidemiologically the incidence of severe spinal pain and sciatica becomes increasingly less likely beyond the age of 50.
- The body's ability to regenerate and improve the health of its tissues with the right conditions.

Intensive neurophysiology education for LBP patients can produce significant improvements in reported function and self-efficacy and physical performance tasks (SLR and forward bending range) (Moseley et al 2004). Information alone does not change behaviour for all patients (Fordyce 1976, Muncey 2002a). It is important that patients learn to change previous beliefs through actual, disconfirming experience.

Fear-avoidance behaviour from fear of pain or fear of harm/causing damage to tissues

Continuing avoidance of pain-provoking activities is a strong risk factor for chronicity and is best tackled pre-emptively when administering acute treatment and advice (e.g. Fordyce et al 1986).

Vlaeyen and colleagues (1995, 2000) proposed a model of fear-avoidance, finding that exposure (the treatment of choice for phobias) is also effective for fear-avoidance related to pain disability (Figure 13.1).

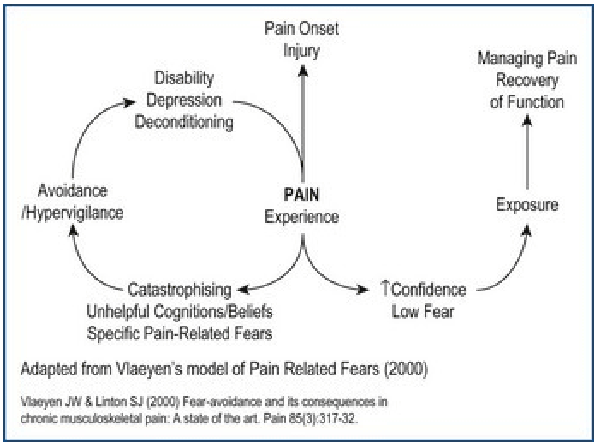

Figure 13.1 Model of fear-avoidance.

Adapted from Vlaeyen J.W.S. and Linton S.J., 2000. Fear-avoidance and its consequences in musculoskeletal pain: a state of the art. Pain 85, 317–322. This figure has been reproduced with permission of the International Association for the Study of Pain® (IASP®). The information may not be reproduced for any other purpose without permission.

Each time a situation and associated anxiety is avoided it becomes more likely that avoidance will occur the next time the situation or activity occurs. Avoidance is reinforced by the feeling of anxiety reduction. Therefore avoidance can occur repeatedly in the long term with patients becoming convinced that they cannot cope in such situations.

By avoiding feared movements or feelings patients fail to learn:

- How to cope with difficult situations.
- That anxious feelings do not increase to the point where they lose control or something terrible happens.

If fear-avoidance is present or developing it should be tackled immediately. Beliefs contributing to avoidance are explored and patients guided to try small amounts of the avoided activities, gradually building up in a systematic rather than pain-dependent way. Patients then need to consider all movements or activities they continue to avoid. Some forms of avoidance can be subtle, e.g. continuing to follow doctors' advice rigidly and for longer than necessary when it promotes avoidance; not accepting challenges; talking about activity rather than actually doing it.

Catastrophising

Catastrophising refers to having a negative view of the pain experience, the situation and the future: fearing the worst. Such preoccupation has been identified as a risk factor for pain-related fear and long-term disability.

Example of catastrophising:

'I can't cope with the bus jolting my back, so I won't be able to go to work. My colleagues will think I'm not pulling my weight and get fed up with me, my supervisor

will report me to the management and I'll lose my job'.

Physiotherapy management strategies might include:

- Identify patient's beliefs about the cause of their pain and its treatment.
- Explanation to help patients understand their condition.
- Where needed, challenge what patients think, feel and do about their pain.
- Educating patients about graded return to normal activity, in the presence of pain.
- Setting collaborative goal-focussed targets aimed at return to meaningful and rewarding activities.
- Providing information on pacing activity, relaxation and flare-up management.

Overall management should focus on providing the patient with ways to help them regain control over their life, with active strategies to help them maintain or recover lost function.

Low mood due to the consequences of the injury

Physiotherapists will not directly treat depression, they can still have a powerful effect via:

- Increasing activity levels which directly affect mood.
- Ensuring patients feel believed.
- Ensuring patients realise that others with similar injuries recover even though pain may continue for a while.
- Encouraging patients to work towards specific activities/goals that are rewarding and meaningful to them, particularly where they thought these may be unachievable.
- Helping patients develop hope for their future.

If depression is a problem help patients recognise what strategies have helped them manage mood in the past. Assist them in putting together their own plan for when their mood is low in the future. Follow your department's suicide policy to check for risk.

Expectation that passive treatments rather than active participation in therapy would help

Patients report they attend A&E or their doctor frequently, make frequent requests for medication, treatments and therapies. They seem unwilling to take their medication according to prescription, or comply with self-management strategies, e.g. 'When I get this leg pain I usually see a marvellous physio, the manipulation really fixes it. Can you do it too?' Robson and Gifford (2006) help us think about the actual neurobiological effects of manipulation rather than the folklore, but the psychological consequences also need consideration if it appears patients are not expecting anything other than symptomatic treatment and becoming dependent on interventional treatment (Muncey 2002b).

Patients not making expected improvements after 2–4 weeks of treatment for an acute problem

Whilst you should be aware of red flags, most cases taking longer than normal to recover may be influenced by fear of activity or harm. Patients pick up on a therapist's anxiety too, such as when responding to questions about bladder function, tripping and dizziness.

Both therapists and patients need to remember that injuries such as fractures and ligament sprains take quite a considerable time to return to feeling like they did before the injury. While function can return pretty quickly, pain may still be present first thing in the morning, after inactivity, doing something new, and when stressing the part in more challenging ways. This is not a sign of anything more than remodelling and some secondary hypersensitivity. It merely requires ongoing stressing of the collagenous tissues and challenges to the somatosensory cortex.

Patients who have significant difficulty with activities of daily living (ADL) or work for more than 4 weeks

These will be early signs of blue or black flags for which there is strong evidence for LBP (Waddell et al 2008) and whiplash-associated disorders (Burton et al 2009). Provide a strong message about the importance of being at work, and advice about light duties and a paced return to usual work.

Blue and black flags (Box 13.3)

Box 13.3 Stepped approach to managing musculoskeletal problems

<2 weeks: support

- Advice
- Symptom control

2–6 weeks: intervention

- Identify psychosocial obstacles
- Develop a plan for early return to activity and work

6–12 weeks: progression

- Check for ongoing obstacles
- Expand vocational rehabilitation

>12 weeks: multidisciplinary approach

- Move to cognitive behavioural approach
- Maximise return to work/activity

>26 weeks: social solutions

- Community support
- Provide communication channels

• Avoid unnecessary medical intervention

From www.kendallburton.com

Supporting work maintenance: developing a plan, taking action

Helping people to stay at/return to work requires a simultaneous combination of work-focussed healthcare and an accommodating workplace. Both need to collaborate, communicate and combine information. The imperative is to prevent development of negative psychosocial influences since these reduce workers' ability and willingness to participate in productive activity (Gifford 2006, Shaw et al 2009).

Chronic pain

Patients with established chronic pain may need help in accepting and managing their pain as chronic.

Addressing negative findings

X-rays, scans and blood tests may show normal results related to past resolved pathology and age-related changes. Focussing (without good reason) on speculative hunts for peripheral tissue-based diagnoses or positive tests, rather than acceptance of chronic pain (a CNS function problem) and self-management is detrimental to patients (Haffner 2002). A cure-based focus encourages fear avoidance, poor self management, and development of chronic disability. It is natural to question a new direction when present skills feel inadequate for dealing with it; to feel angry, distressed and to grieve when a past pain-free life is lost. Further despair will come with every negative test or failed treatment.

Rather than seeking more tests, rely on experience of the wide range of 'normal' and of chronic pain, if uncertain, ask a more experienced colleague. A thorough assessment, clinical reasoning and following guidelines is the recommendation, however if you feel concerned, ask for guidance.

Chronic pain management: a biopsychosocial approach

If pain is determined to be chronic, the focus moves from cure to:

• Acceptance of chronic pain.

• Tissue health, rather than cure.
• Building fitness and the self management of chronic pain.

Patients favouring a medical 'fix it' approach can be a challenge for the physiotherapist promoting a self management approach. Employing psychological models and principles of change helps to facilitate rehabilitation, making sense of the patient's predicament and providing possibilities for change and improved function (Harding and Williams 1995).

Disability level in pain patients is more strongly linked to pain beliefs, expectations, coping styles and perceived control, than to pain intensity, chronicity or pathology. This does not mean patients have mental health problems: feeling depressed, anxious, frustrated or angry is to be expected with chronic pain.

Cognitive-behavioural pain management (C-BPM)

C-BPM is a broad group of interventions involving the application of principles derived from the study of behaviour change or learning, and experimental methods to change the ways in which pain sufferers perceive and react to their pain (Bradley 1996, Turk 2002). It requires patients to be active participants in the process rather than passive recipients, helpful in achieving an increased sense of control. It recognises that there are complex interactions among cognitive, affective (emotional) and behavioural change. Positive change in one of these areas may promote positive change in the others.

The methods involve active problem-solving, applying coping skills, and addressing unhelpful beliefs and responses. Learning to do this through modelling, role playing, or practice with coaching and feedback is almost certain to help patients think of themselves as more able to deal with problems. The key book for health professionals on C-BPM is Main and colleagues (2008); for patients: Nicholas and colleagues (2011).

Chronic pain model

A chronic pain model useful for patients is that of Nicholas. It helps them see the many consequences of having chronic pain, and patients can be helped to expand on this model themselves: looking at their losses (ranging across work, social life, family life, hobbies and sport), unhelpful consequences and the interactions between them. Although chronic pain itself may not be curable, these factors contribute a large proportion of the suffering associated with chronic pain, and are amenable to pain management (Appendix 13.1).

Chronic pain and depression

Considering the on-going nature of chronic pain, it is not surprising that one consequence is a high incidence of suicidal thoughts. Suggest that with ongoing pain it is normal to feel

depressed, if the response is affirmative, then enquire whether they have thought of harming themselves.

Your unit's suicide prevention policy will give guidance on assessing risk and what to do if patients are feeling suicidal. First, sensitively find out any meaningful reasons they have for not carrying out such thoughts (e.g. my children need me). If a patient can give you no reasons for continuing and has plans for how to end their life, e.g. a medication stockpile, you need to ensure they:

- Are feeling safe to return home.
- Will seek long-term help and know where to obtain this.
- Have a source of emergency help such as a trusted family member or friend; know how to contact the Samaritans if things escalate.

If patients are revealed to be actively suicidal then obtain professional help immediately. You may need to escort them to A&E or a source of psychiatric liaison. Whenever it emerges that patients are significantly depressed, but not currently receiving help from their local mental health team, inform their GP of your findings, including the means of suicide if these are revealed to you. You will need to ensure that you receive a debrief after such an event, as it can have an impact on health professionals too.

There is strong evidence that C-BPM has a powerful positive effect on depression due to pain.

Physiotherapists' 'manner' and interaction with patients: facilitating patient change and empowerment

'Helping' patients by providing physical support, being the sole source of information, and always finding solutions for problems results in patients being disempowered and unlikely to maintain improvement beyond treatment. Instead:

- Use active listening skills, asking about their experiences; check you have understood them. Check how your information fits with their understanding and experience.
- Use a collaborative approach, rather than that of an expert.
- Use operant principles when helping patients practise motor skills or make decisions. Make achievements the focus and the route to improvement rather than 'correcting' patients or pointing out what you don't want.
- Empower patients; let them take the credit.
- Place more emphasis on learning through experiment and reassessing past experience.
- Use clinical reasoning as an evolving process; patients have hypotheses too that will alter as assessment and pain management proceeds. Involve them in this process (Jones 1995, Butler 1998).

- Use Socratic Questioning to help patients discover links and answers they need; see they have this within them. If patients say something you disagree with, don't initially say so. 'That's interesting' then later 'I wonder what would happen if....?' Help patients review their initial assumptions.

Pain behaviour and the physiotherapist

Patients may feel that they have not been believed, this presenting as either seeming indifference or in higher levels of pain behaviour and pain talk. Ask the patient: 'A number of patients report they haven't always been believed about their pain. What is your experience?' Many times patients are not aware of the effect of their pain communication: 'Oh, I was just trying to deal with the pain; it's really bad today'. Acknowledging this and emphasising that you believe them and are aware of particularly bad days is immensely helpful.

Patients may assume that physiotherapists will resort to coercion or bullying when they believe a physiotherapist's expectations are more than they can cope with. The undoubted effectiveness of physiotherapy is testimony to physiotherapists' abilities to teach and improve patients' confidence. However, some patients require special handling, e.g. the very anxious, or those frequently reporting that movement or exercise makes the pain worse or unbearable.

Operant learning

On Monday you go into a shop, wait politely, but don't get served.

On Tuesday you go into a shop, bang on the counter and get served straight away.

Which behaviour will you tend to use when you go to the shop on Wednesday?

If patients finish a physiotherapy session with a sense of achievement and that the physiotherapist is pleased, they are likely to do their home programme, look forward to the next session and attend well.

If, however, they finish a physiotherapy session in severe pain and the physiotherapist appears indifferent to how hard they have tried, they are likely to leave with a sense of hopelessness and unlikely to return.

This involves using reinforcement following specific behaviours. A reinforcer is defined by its effect on the behaviour it follows and is usually something 'pleasant', appreciated by the individual (praise, attention and interest, a prise). A child's naughtiness can actually be reinforced by smacking if this produces the attention the child craves. Activities that patients learn to do should eventually be reinforcing in themselves, giving a sense of enjoyment, satisfaction or achievement. Until this occurs, patients need reinforcement from other sources to bridge the gap. This may be provided by their physiotherapist, friends or family, or self-provided: rest, chocolate or time alone to play favourite music.

Cairns and Pasino (1977) studied the effects of reinforcement on LBP patients receiving daily measurement of walking and exercise bike distance. Significantly more performance increases were obtained when patients were reinforced (praise and engaging in desirable conversation only if walking or bike riding distance increased over its previous level).

When starting new exercises with patients, physiotherapists will achieve quicker improvement by reinforcing immediately and frequently. Once this has been established, less frequent praise keeps improvement continuing.

Stopping behaviours (e.g. repeatedly talking about pain) is tackled by removing the reinforcers previously sustaining them. Pain is acknowledged not ignored, but the focus is on change despite it. Faster improvement and less anxiety are also seen when patients observe reinforcement being used with other patients.

Avoid criticising the quality of patients' attempts, e.g.:

> *'Higher with that leg, keep your weight on that buttock, don't let it lift up, that makes you use the wrong muscles and your back twist'*

Use reinforcement to achieve more rapid and enduring improvement, e.g.:

> *'Great, that leg's higher now, you're putting more weight through your right buttock which makes your back straighter. You're coming on really well with that. I think you're ready for the next stage.'*

If no improvement can be discerned, reinforcement can still be given to help confidence and aid progression, e.g.:

> *'That's a difficult exercise for you, you're doing very well to keep trying and I noticed you're still remembering to keep your left arm relaxed as you do it, great'.*

Physiotherapists can use varied non-verbal ways of reinforcement, e.g. hand gestures and facial expression, interest or concern. Reinforcement is also a means for learning, e.g. include what you want in your praise: 'your shoulder muscles look so much more relaxed, looser now; that's really good improvement'. This results in more frequent relaxation than 'your shoulders are very tense, try to relax them'. Information is provided about what is appropriate. Curiosity is a powerful drive, so providing information is also itself a reinforcer. This is a subtle process and more details on how to use operant learning are given in Harding (1998).

Many activities eventually become reinforcing in themselves. More naturally reinforcing social goals such as going dancing, joining a yoga group, or using Nintendo Wii Fit as part of a family 'challenge' may strongly help patients prioritise and maintain activity.

Empowerment, problem-solving and self management

Empowering patients and providing them with opportunities to problem-solve and discover solutions is vital if patients are to take an active role. It helps confidence and increases the likelihood that patients will continue after discharge. It is important to encourage patients to use and develop their knowledge and experience, operantly reinforcing this. See Appendix 13.2.

Social or observational learning: modelling

Modelling is an additional technique to help patients regain past motor patterns or learn new ones, e.g. as you walk with them, emphasise the components of a rhythmical relaxed walking pace such as loose back, knee and ankle movement and free arm swing. Use humans' innate ability to imitate behaviour; your movements helping them see what you mean and initiate new behaviours.

Sometimes patients are unaware of their behaviours. When other methods have been unsuccessful, it is sometimes necessary to 'hold up the mirror'. Video-recording of patients' walking can be reviewed with them to see their achievements and identify areas for progression.

Socratic questioning

Socrates used provocative questions to challenge clients' underlying beliefs about themselves. Using Socratic questioning rather than a didactic approach:

- Helps patients feel respected and capable of understanding and working towards a solution for their difficulties.
- Helps patients counteract and challenge negative thoughts/beliefs.
- Trains patients to think differently, enabling them to feel better and more positive about themselves.
- Encourages ownership of the solutions to their problems.

The goal is to teach patients a process of evaluating their goals, thoughts, behaviours, moods, life circumstances and physiological reactions so that they can learn methods for improving the management of their pain problems.

Socratic questioning involves asking patients' questions which:

1. Patients have the knowledge to answer: What are facts; what are simply perceptions? What evidence supports or contradicts those perceptions?
2. Draws patient's attention to information which is relevant to the issue being discussed but which may be outside their current focus: How else can the situation be perceived? How might an acquaintance or family member see it?
3. Generally move from the concrete to the more abstract so that
4. Patients can eventually apply the new information to either re-evaluate a previous conclusion or construct a new idea.

The questions are less about challenging or changing beliefs as guided discovery. Socratic questioning often goes hand in hand with behavioural experiment; further details can be found at http://www.padesky.com/clinicalcorner/pdf/socquest.pdf.

Coping strategies

Physiotherapists can encourage patients to regain purpose by reviewing their desired goals.

Refining and using their more helpful coping strategies, challenging less desirable ones, and practicing new ones will ensure they broaden their expectations and achieve wider goals.

Values, goal setting and pacing

Common changes that some people with chronic pain report include:

- Not working.
- Reduced level of housework or DIY.
- No longer easy to do things.
- Decreased pleasurable and social activity.
- Not trying new activities.
- Rest or reclining frequently during the day.
- Sleep problems.

Finding a focus for moving forwards in pain self management is an essential starting point.

Values

Our behaviour is influenced by what values we prioritise; having a chronic condition may lead to loss of core values. Some patients report putting so much time and energy into hunting for pain 'cures' that they lose sight of the important things in their life.

When setting goals identify the values and areas of life that are important to the individual, so that goals can be based on these, e.g.:

- George exercises because he has been told to by a physiotherapist.
- Geoff exercises because he wants to be able to take his son to the park to play football with him.

Who will continue exercising when the going gets tough?

Helping chronic pain patients to examine their values identifies what they care most about and want their life to stand for. Values provide motivation for behaviour change which is more likely to be sustained. Higher success at living in accordance with values correlates with less physical and psychosocial disability, less depression and interference with functioning, and less pain-related anxiety (McCracken and Yang 2006).

Value domains include:

- Social relationships.
- Family relationships.
- Intimate relationships.
- Education/learning.
- Work/career.
- Growth/self-development.

• Recreation/leisure.
• Spirituality.
• Citisenship/community.
• Health/physical well-being.

Values are the overall direction and goals are the end point, e.g. if a patient's value is being a loving attentive parent, a goal might be to go swimming weekly with their daughter.

Goal setting

Having considered values, then turn to the practical goals they would like to achieve in the future. Goals should be determined in terms of what is observable or measurable (e.g. return to specific duties at work, playing football with my son for 30 minutes). Initially longer-term goals for the next 6 months or more will be chosen and preferably from a range of domains: work, hobbies, social, family/relationships. It is essential that pleasurable goals are chosen as well as more work-focussed goals to ensure life-balance is maintained.

The acronym SMARTER (some use SMART) helps the process of goal setting (Appendix 13.3).

It is often necessary to set short-term goals that are achievable to begin with, e.g. returning to work as a self-employed builder may have short-term goals of decorating the living room within a month or fixing my mother-in-law's leaking taps one by one.

Patients must also consider what is preventing them achieve them, e.g. the fear of jarring involved in travelling on a bus, or lifting.

They then try to work out the steps to achieve their goals, breaking them down into their constituent parts. Outcome goals should be set in combination with performance goals (e.g. exercise and building blocks) providing the mechanism by which to achieve final goals.

Principles of pacing activities

Pacing is the steady build-up of an activity whether increasing the numbers of exercises, distance, or the time spent doing an activity or maintaining a static posture.

Using the goal-setting approach links behaviour change and treatment goals to patients' longer-term goals by means of pacing: a systematic and graded approach to building up an activity. This provides time for changes in strength, flexibility and stamina needed to break habits of overactivity/underactivity. Patients push on with activities on better days (the 'danger' days!) then rest/avoid activity when the overactivity has resulted in pain flare-ups, e.g. the back pain patient who goes shopping on a better day, only to find that the less frequently performed activities such as bending and lifting cause a flare-up in the pain prompting 2 or 3 days being very careful or resting to settle it down.

Pain is not a helpful guide as to when to stop, often telling patients to stop too late, or hurting before they have barely started. By setting baselines, then pacing activity, patients learn what is manageable. It is physiologically more astute to work to physical capabilities than rely on sensation that is fickle and influenced by so many different factors. When

helping patients return to or improve activities the following basic principles are useful:

- Patients make all decisions and learn principles for future activity, which encourages ownership.
- Make a plan. Prioritise what has to be done on a daily basis.
- Start activities with realistically low 'manageable' baselines, then build up tolerance to the activities gradually and systematically.
- Take regular rests between activities.
- Change position regularly while performing activities.
- Do small amounts often, rather than doing everything at once.
- Avoid long unbroken periods of either activity or rest.

Pacing from modest baselines is incompatible with overactivity/underactivity cycles so helps change this habit.

It is suggested patients: Make two or three measurements of the activity, ideally at different times of the day.

- Set their first baseline as a 'toe in the water' and all with the intention that they are easily manageable, both at the time and for the consequences.
- Find the average of the baseline measurements and start at 80% of this, reducing the risk of starting too high for confidence or the level of provoked pain.

It helps to explain to patients that a baseline cannot be set too low since the amount will build up with pacing, but that if they start too high, they will not be able to maintain activity on bad days and will not have learnt to break overdoing or pushing habits. If patients have had a problem for many years there is no need to rush towards achieving high levels of activity or fitness. It is more important patients learn how to do it, since they can then continue the process themselves over a more realistic timespan with confidence.

An adverse response (severe or unmanageable pain or loss of confidence) to a rapid build-up does not favour long-term progress. Be explicit, e.g. 'You have planned to increase to doing three times as much in a week. If you really think that rate is manageable then try it. Remember though that you have a habit of pushing on and aiming high, which has tripped you up in the past. How about trying this new way? It may be more of a challenge for you to do less than to do more. What do you think might happen if you went more slowly?'

If the patient decides to race ahead, then finds it hard to keep going then this is still an opportunity: 'What have you learnt from this? How about going slower and seeing what happens?'

Paced improvement is not always faster or more. Walking very slowly is much more difficult; starting at a more relaxed, natural speed may actually be easier. When walking is difficult and painful, this does not necessarily mean running is even harder; it is occasionally easier to start with running. In C-BPM it is recognised that confidence, or conversely, fear are the main drivers for progress and sense of achievement. The section on graded exposure will demonstrate how a gradual build-up in activity on a fear scale rather than a physical

difficulty scale is more effective in returning patients to function and achieving goals.

Set-back plans

Sooner or later patients need to cope with a set-back. Usually pain flare-ups can be managed with a flare-up plan, reminding patients to utilise helpful coping strategies for a difficult day. Sometimes, however, patients feel they cannot manage this; the flare-up is lasting more than a day or two, or they also have an illness, minor injury or family crisis to cope with. Having a plan for set-backs keeps them in control without feeling that their pain has taken over again.

- Help patients put together a set-back for activity and exercise – cutting back, for example, by 50% and building back up in 5 days, or whatever seems appropriate for the problem they are dealing with.
- Encourage prioritisation, but ensure pleasurable activities remain to help them get through.
- Suggest a flare-up box, e.g. enjoyable DVD/CD, inspiring letter, or engrossing book as a reward for keeping going with their plan. Include reminders: what are the usual risks, how to combat these; ring a supportive friend.

Goal setting has a central role within rehabilitation and C-BPM. This chapter can only touch the surface. More, very readable and practical, insight into goal setting and its process has been written by Gladwell (2006).

Relaxation

Relaxation training involves helping patients learn ways of calming themselves and reducing muscle tension, either by listening to a prerecorded CD or following spoken or written instructions. Patients follow the instruction from memory for everyday situations.

Advice for patients includes:

- Reserve specific, undisturbed times of the day, e.g. negotiate with/tell the family, switch off the phone.
- Begin to learn relaxation techniques using comfortable postures initially, whether sitting or various lying positions.
- Wear comfortable loose clothes.
- Be realistic; don't expect to grasp the skill quickly or completely. Regular practice will make a difference.
- Try out a range of skills. While one or two techniques may come more naturally, persist in practicing a range: backups for challenging circumstances.
- Practise techniques for a range of needs: mental relaxation (e.g. mindfulness), breathing techniques; physical tension release (e.g. progressive muscle relaxation); distraction (e.g. imagined scene).
- Practise when comfortable and quiet, progress to less comfortable, noisier places; learning to both switch these out or relax despite them.

- Some techniques lend themselves to frequent 'take 5' moments in the day to assist pacing and stop a build-up in mental or physical tension.
- Mini-relaxers: briefly scan the body for tension, relax it, return to the previous activity. Patients may notice problem areas (e.g. the shoulders, stomach or jaw), which tense during activities (e.g. driving).

Some useful methods and ideas for patients can be found in Nicholas et al (2011).

Attentional techniques

Another form of relaxation:

- Begin with techniques that distract from the pain through attention to imagined pleasant scenes or future plans, or attention to external stimuli such as music, scenes or smells.
- Patients may then try imagining scenes which, while including the pain, focus on their pleasant or exciting aspects, or change the pain into something more pleasant, e.g. the feeling of a red hot poker becoming a warm evening sun.
- Finally patients use techniques that focus their attention on the pain. It is a way of gradually approaching the pain, even examining it in detail. Patients can explore their response to the pain too.

These techniques tackle avoidance, so may need gradual or graded exposure, but allow patients to explore fears of what would happen if avoidance was gradually discarded: a process of challenging beliefs, desensitisation and habituation.

The cognitive model

This links the thoughts that patients have about their situation with their feelings. Cognitions include pre-existing beliefs, assumptions, expectations and perspectives: patients' 'way of seeing things'. They are self-statements patients think to themselves, often quite fleetingly, and are reflected in what patients say to others.

Some cognitive styles or habits are more unhelpful to pain patients by preventing progress in rehabilitation, adjustment and acceptance. Some common ones can be found in Appendix 13.4.

Cognitive approaches to pain management aim to help patients monitor and capture these thoughts, and link them to their feelings. Patients are then taught how to replace unhelpful thought patterns associated with feelings such as distress, frustration, anger, depression or confusion with more helpful ones. Some examples are found in Appendices 13.5–13.7.

Fear-avoidance

Both fear of pain and fear of harm can be operating in people who have fear of movement. It is the experience of anxious feelings that drives the person to dread and hence avoid a feared activity or situation. This might include lifting/carrying, being jostled in a crowd or bending.

There are two main ways of working with patients on fear of activity: behavioural experiment and graded exposure.

Behavioural experiment

How we interpret situations often guides our behaviour, e.g. chronic pain patients who have quite strong beliefs about their pain: 'Unless I stop moving when I experience pain, I will make it worse and cause more damage', are more likely to restrict activities and come to fear movement.

Therefore it is important we are aware of patients' beliefs and what meaning they attach to activities, e.g. a patient thinks the pain in her hands comes from overusing her computer: 'I have caused the pain and therefore what I do can make it worse.' This can lead to feelings of guilt, fear of damage and avoidance of hand movement. Her negative automatic thoughts could be: 'this is it, my day is ruined', while her assumptions/predictions could be: 'if I don't stop immediately when I feel uncomfortable, my pain will increase'. Behavioural experiments help people challenge these thoughts by trying new behaviours, then looking at evidence from the experience.

Behavioural experiments directly challenge false beliefs, and reinforce how predicting the future is unhelpful and cannot be relied upon. It is usual for elements of doubt to remain, but these can be a focus for further experiment.

Behavioural experiments are performed where the key feature is fear; they would not be done where physical impairment meant that the patient was at risk of failing.

Observing patients while they enter and move around the building, use their aids, and undress for assessment will give you clues for what is feared. It is important not to remark on what they can do: 'Oh, I saw you could stand on your right leg when you step out of your trousers'. Patients might take this to mean you don't believe them, don't understand how painful it is, or are trying to catch them out. Acknowledging the difficulties 'I can see how difficult it is to stand on your right leg: do you have any concerns about walking?' will gradually elicit the fears and move towards material for doing behavioural experiments.

It is crucial to set experiments up as 'no lose'. Whatever the outcome, something important can be learned from it. Even if it does not go to plan, it is still valuable, because we can then look at what happened and adjust future plans accordingly.

Case study 13.2 on behavioural experiment illustrates its practical application. For further reading, Bennett-Levy and colleagues have produced a book on behavioural experiments for those helping patients to manage their emotions (Bennett-Levy et al, 2004).

Graded exposure

Fear of pain can be more disabling than pain itself and frequently needs to be the main focus.

To overcome avoidance of anxious situations and activities, they are tackled one step at a time in achievable stages. The method of returning to a safe place should be clear. If patients report frank panic attacks or actual phobias, then graded exposure should begin with a psychologist present.

Teach the rationale and process of graded exposure, so that patients can apply these to other settings:

- The importance of facing feared situations.
- Understanding that avoidance is the main contributing factor. If avoidance continues fear tends to generalise to more settings.
- 'Exhaust' the anxiety by staying with it rather than using avoidance.
- The role of behavioural experiment: rating expectations of pain and anxiety feelings.
- What the 'graded' of graded exposure means, practically.
- Prepare patients for the tendency for fear/anxiety feelings to return, and the need to practise exposure on a regular and frequent basis, even after it appears to have been overcome.

Patients are encouraged to firstly set up a hierarchy of related feared activities from mildly disconcerting to extremely anxiety provoking, rating them 0–100 on provoking anxiety. The example in Figure 13.2 shows the contrast between an activity hierarchy and a fear hierarchy.

100	Running down whole flight of stairs alone
100	Running up whole flight of stairs alone
100	Walk down whole flight of stairs, alone no handrail
95	Walk up whole flight of stairs alone no handrail
90	Walk up/down whole flight of stairs hand lightly on the rail
85	Walk up/down whole flight of stairs, no-one there in earshot
70	Walk up/down whole flight of stairs, friend in next room
70	Walk up/down small flight of stairs, no-one in earshot
50	Walk up/down small flight of stairs, friend in next room
50	Walk up whole flight of stairs, friend wait at the bottom
30	Walk up/down whole flight of stairs, friend behind me
30	Walk up/down small flight of stairs, friend wait at the bottom
20	Walk up/down small flight of stairs, friend behind me
10	Step up and down 2 steps, friend behind me in case

Graded Fear Hierarchy

Run up 2 at a time and run down 1, 2 then 3 times
Run up/down 1 flight of stairs 1, 2 then 3 times
Walk up and down 2 steps at a time going up 1, 2 then 3 times
Walk up and down 1 whole flight of stairs 1, 2 then 3 times
Walk up/down small flight of stairs 1, 2 then 3 times
Step up and down bottom step 1, 2, 3, 4 5 then 6 times

Figure 13.2 Graded activity versus graded exposure.

It is important that patients are in control. The first steps should be sufficiently challenging, but not so anxiety provoking that patients find them hard to manage. Tasks that do not provoke anxiety at all are not helpful; aim to start around 20–30/100 of anxiety. Try

to space the steps evenly in terms of the anxiety they provoke.

Patients need to stay in the chosen anxiety-provoking situation to experience the plateau of this feeling, then stay longer until they discover that it reduces – no more than 10–15/100. With the first time it may take a long time for the anxiety to reduce. The next time, however, the anxiety may not be quite as bad, fading in a shorter time. 'Safety behaviours' will tend to be adopted, e.g. taking the mind away from the feeling of anxiety, using the physiotherapist as a source of reassurance, compensatory movements to avoid weight bearing, bending. These need to be watched for by the physiotherapist and patient so they can be stopped or avoided.

It is essential patients finish each session with a sense of achievement. Explain that the fear feeling tends to return; it will be there again next time, but will go a bit faster. Gradually, patients tackle increasing amounts of the feared activity, and deliberately integrate it back into everyday life: gaining a sense of achievement. The fear hierarchy will also change, the higher scores beginning to reduce.

It can be seen that time needs to be set aside to do graded exposure since it is imperative that patients stay with their anxious feeling until it subsides, and finish a session with very low levels of anxiety.

Occasionally a task is started that despite a prescore of 30/100, proves to be much more when attempted. The task should immediately be stopped then rescored and restarted based on this experience.

If patients deny fear but still wish to avoid 'unnecessary' pain, introduce them to desensitisation: working towards normalising the sensory cortex input and gradually altering its output. Hearing of other patients' achievements in similar situations will help them believe this is possible, and worth working at to avoid increased pain and hypersensitivity in the long term. Frequently, when desensitisation begins, then fears emerge. This can be acknowledged and tackled with graded exposure.

Treatment specific to pain type/syndrome

As well as C-BPM there are specific treatments or advice for various pain syndromes.

Neurogenic pain: slowly developing regional musculoskeletal or 'neuralgia-like' pains

Gross signs of nerve conduction problems will be absent, but subtle changes can occur such as the reduced vibration sense found in work-related upper limb disorder, carpal tunnel, capsulitis, epicondylitis and osteoarthritis (Laursen et al 2006). The mechanism here is not fully known, only that it is considered central since these changes are bilateral in unilateral conditions. Axoplasmic transport stops when a nerve receives insufficient oxygen/blood supply: a consequence of sustained posture and unvaried overuse, influencing the chemicals

received in target tissues. Patients may appreciate this information about their otherwise mysterious condition. Now it is chronic however, reviving axoplasmic transport would not bring *complete* resolution; the die is cast in the CNS so pain management needs to be the focus.

Neurogenic pain: fibromyalgias

There is no intervention that eradicates fibromyalgia syndrome (FMS) symptoms. Nevertheless, some treatments may be helpful even if they do not offer a cure: regular physical activity supports a favourable long-term outcome. Belief that pain is due to damage however, prevents patients from discovering this. Stress management, education, self-management and C-BMP strategies help achieve good results in FMS management (see Moores 2002).

While joint hypermobility confers benefits – for sports such as swimming, dance and gymnastics, and for knee arthritis and bone mineral density in older age (Dolan et al 2003) – a few people with joint hypermobility seem to be prone to spasm flitting to many muscles, and symptoms of fibromyalgia. It has been observed that they tend to need to build up (pace) new physical activities more gradually, and generally tend to have higher levels of training pain with new activity (Harding 2003). These patients frequently report stretch is beneficial for symptoms (Harding 2003).

Neuropathic pain: complex regional pain syndrome (CRPS)

There has recently been an explosion of research into effective methods of treating this terrible condition. This is a specialist area which you may take future interest in. Moseley's study (2005) demonstrated that sequential activation of cortical motor networks using hand laterality recognition, imagined movements and mirror movements, is the most effective management progression. It gives insight into why and how CRPS can be helped. The NOI website (http://www.noigroup.com/) gives a wealth of clinical guidance and support in this area. CRPS however can be severely impacted on by inappropriate management. 'Dabbling' is not recommended; a thorough immersion in the literature and clinical training in application of these evidence-based techniques is.

Treatment formats

Individual versus group

Individual patients appreciate learning from their physiotherapist about the experience of

other patients. However, while physiotherapists can do really helpful work with individual patients with chronic pain disability, the advantages of group work make it worth finding an appropriate group for these patients. Patients learn from each other: group work is powerful for change, helping patients shift their beliefs through social learning via others' and their own experiences. There are many groups around the country that can be utilised.

Expert patient groups

These were set up nationally, with training for patients with chronic conditions to teach others in self-management. Pain is the most common condition within a range of others seen by these groups. There is much we as professionals can learn from them. A local group may allow you to observe their sessions, giving you insight into which of your patients could benefit. Useful details and patient literature can be found on http://www.expertpatients.co.uk and http://www.paintoolkit.org.

Back to work and functional restoration programmes

These are outpatient groups run usually by physiotherapists, though some have psychologists who do teaching sessions to specifically work with patients on their cognitions and mood.

Outpatient pain management groups

These are interdisciplinary: professionals from a variety of disciplines working together in an integrated way with the same model and approach (usually C-BPM), joint goals and ongoing communication. These can range from daily to weekly and it is usual for a programme at a centre to have a standardised format and length. Patients need to be able to travel to and from the unit each day of the programme.

Intensive pain management programmes

Similar to outpatient programmes, these are generally more concentrated, lengthy and expensive. Patients may attend as a resident or out-patient. They are designed for patients who on the whole are more disabled and distressed by their pain. Patients are expected to attend each session every day during the week. For some patients it is an opportunity for them to be in an environment away from the influence of family members so they can focus on learning pain management skills.

Support for physiotherapists working in pain

Physiotherapists with an interest in pain may join the Physiotherapy Pain Association (PPA). Full membership is available to CSP members though other practitioners may join as associate members.

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Chapter 13

E-materials

Author profiles

Vicki Harding PhD MCSP

Vicki Harding is Research and Clinical Specialist Physiotherapist for the cognitive-behavioural pain management programme INPUT, St. Thomas' Hospital London. Following 8 years experience as a manual therapy clinician and tutor, she helped set up this interdisciplinary residential unit in 1988, initially as an RCT comparing inpatient with outpatient programmes. A founder member of the Physiotherapy Pain Association, she has been a past PPA Chair, and was an associate editor of the journal 'Pain' for 4 years. She gained her PhD in developing physical performance outcome measures for chronic pain management, and joint hypermobility assessment.

John Mclennan PG Cert Pain Management GradDipPhys MCSP

John Mclennan has been the Lead Physiotherapist for the Lothian Chronic Pain Service since 2001, after working for the Borders Chronic Pain Service since its inception in 1994. He had joined the Borders Community Physiotherapy service in 1991 and was the Lead for the Borders Back Service.

John chaired the Physiotherapy Pain Association North and is the current Honorary Secretary of the North British Pain Association. He is a member of the Scottish Government's Chronic Pain Steering Group and NHS Education Scotland's Physiotherapy Educational Forum.

Lorraine Moores MSc GradDipPhys MCSP

Lorraine Moores is Principal Physiotherapist and Pain Management Programme Lead working within the interdisciplinary team at Manchester and Salford Pain Centre, Salford Royal NHS Foundation Trust.

Lorraine is a past Chair of the PPA. She has published on the development of a measurement tool for assessing pain behaviour, Return to Work for the chronic unemployed with pain, and long-term follow-up results for pain management. She has contributed several chapters on case studies and clinical application of pain management.

Appendix 13.1 Self-attribution and problem solving

A Physiotherapist solves the problem/tells the patient what to do

Physiotherapist: 'Hi, nice to see you. You look looser and straighter, your head's moving more freely'.

Patient: 'Oh, is it? I feel much sorer than last week'.

Physiotherapist: 'That's because you're moving more. Show me how the exercises are going' (patient does neck rotation, but with tension in the neck and shoulders and some wincing).

Physiotherapist: 'That looks pretty tense, try relaxing, do it slower, keep breathing'.

Patient: (continues as above) 'Yes, I'm trying to relax, but I can't'.

Physiotherapist: 'Try letting your shoulders sink down, breathe in, then as you breathe out, gently turn your neck'.

Patient: 'Like this?'

Physiotherapist: 'Yes good, but you need to let your shoulders relax down more'.

B Patient encouraged to recognise *his* achievements and problem-solve

Physiotherapist: 'Hi, nice to see you. You're looking looser and straighter; your head's moving more freely!'

Patient: 'Oh, is it? I feel much sorer than last week'.

Physiotherapist: 'So, you're moving better, but it's much more painful. Why do you think that might be?'

Patient: 'Well, I don't know, that's why I asked you!'

Physiotherapist: 'What makes it particularly sore?'

Patient: 'I think it's some of the exercises. I know they're helping, I'm freer, so I don't want to stop them, but whenever I do the turning exercise it seems to set off that awful muscle spasm'.

Physiotherapist: 'That's a good link to have made. What do you think could help?'

Patient: 'Well, I'm trying to relax, but it's not easy'.

Physiotherapist: 'Great, and relaxing isn't easy to start with. Show me how they are going' (patient does neck rotation, but with tension in the neck and slightly in the shoulders).

Physiotherapist: 'What are you feeling?'

Patient: 'Well I'm trying to relax my shoulders'.

Physiotherapist: 'Yes, I can see that, that's good. Anything else?'

Patient: 'It's tight round here (touches right C1 area) and actually that's where it's really sore'.

Physiotherapist: 'Yes, it's really hard to relax where it's really sore. Is there anything else you've tried to help relax up there?'

Patient: 'Well maybe I could do a smaller exercise to that spot to loosen it up, like the nodding exercise'.

Physiotherapist: 'Mmmm Good! I think you're on the right track there. Keep going like that, it will come eventually. Are you pleased with how it's going?'

Patient: 'Yes, it's been stiff a long time, so I suppose that's pretty good!'

NB Notice how both physiotherapists acknowledged the pain without reinforcing the pain talk.

Appendix 13.2 SMARTER goal setting

Specific 'What' and 'how much' to do to clarify what is being aimed for.

Meaningful i.e. linked to their values. If someone's values are travelling and fitness then a goal of walking for fifteen minutes is less meaningful than walking to the library to get a book about Africa.

Agreed Having a stated, written and agreed goal helps focus the patient towards goal achievement; approval helps the patient realise he is on the right track.

Realistic Within financial means, appropriate for age, family situation, etc. not necessarily immediately achievable but gradually, as capabilities improve.

Time-planned Establish 'when' short- and long-term goals are expected to be achieved and the time of reviews.

Exciting It is most important that goals include pleasurable and exciting activities that provide reinforcement for patients' efforts, as well as being relevant to the desired quality of life changes.

Re-evaluated Rather than just checking goal achievement, re-evaluation helps problem solving and skill refinement, e.g. 'I managed well, but put myself at risk of doing too much: next time I need to plan more time for breaks and negotiate a back-up to look after the children'.

Appendix 13.3 Unhelpful cognitions or habits of thinking

- All or nothing thinking: 'If I don't get finished in time, I'm a complete failure' (feel hopeless).
- Mental filter (believing that one negative feature of a situation characterises it all): 'The bus conductor annoyed me, it's ruined the whole day' (feel angry).
- Mind-reading (believing yourself to be thought of negatively by others): 'The physiotherapist must be thinking I'm not trying' (feeling anxious).
- Catastrophising (believing things to be worse than they are): 'My shoulder's hurting again, I must have really injured it, I won't be able to manage work for weeks, I may lose my job' (feel worried, desperate).

- Should-statements (believing that your standards expressed as should, ought to, must and have to, are fixed absolutes – also called 'musturbation'!): 'I should be able to manage lifting that weight/I must finish all my typing today/the physiotherapist ought to be helping me more' (feel exasperated, desperate, angry).
- Labelling (believing yourself or others to be defined by one or more acts): 'It's really pathetic I can't lift my leg, I'm a real wimp' (feel annoyed, a failure).

Harding 1998.

Appendix 13.4 Cognitions in a social exercise setting – alternative cognitions & problem solving

The patient has stopped going to the gym. She thinks to go again she:

- Has to be as fit as others in the class or she will hold things up.
- Has to be able to do the whole class.
- Can't start until she has lost weight, and has a new track suit.
- Can't go until she feels her old fun self to join in with the banter and go out after for a coffee with her group of friends **(should statements)**.

She feels she has to be pain-free/to have a lot of time to do all this, and so it becomes 'impossible' **(all or nothing thinking)**.

She would be encouraged to look at what others would expect considering her circumstances and pain, and whether her friends would rather want to see her again or just have someone else in the class who was fit **(more helpful cognitions)**. Alternatives to being fit, slim and 'the life and soul' can be investigated **(problem solving)**:

- Go and talk to the class instructor about what has happened and how she will start with just part of the class or the easier exercises to start with.
- Borrow her sister's Nintendo Wii Fit to get started and build confidence.
- Ring her friends and explain her situation to them.
- Remind herself how another friend tackled returning to the class after a bereavement/an operation: what seemed to work for her.

Appendix 13.5 Helpful cognitive strategies from sport

Just before competing:

NOT focusing on:

- How well the other person may have won last time.
- That he has won 3 out of the last 4 matches.

Focusing on:

- Your achievements during training.
- Times when you have won and focusing on the strategies that helped this.

Appendix 13.6 Misunderstandings or conflicting beliefs

Physiotherapist: 'You have pulled a muscle in your leg so it needs exercise to help it heal up'.

Patient (thinks): But the trapped nerve in my bottom is pinched when I exercise, the pain is really sharp – it's excruciating – I can't possibly do that, I could cause severe damage to the nerve.

Case Study 13.1

Background

30-year-old female passenger involved in a rear-end collision while waiting at traffic lights a week ago.

She reports the headrest adjustment was loose and low, so her head went back over it before whipping forwards. The seat belt stop jerked her neck to the left.

There was little pain immediately, so she refused to go to hospital but saw her GP the next day after waking with a stiff neck and increasing neck and back pain. The GP gave her dihydrocodeine and anti-inflammatories and told her to 'take it easy'.

She now complains of severe pain and tenderness over the whole posterior neck and neck muscles, particularly around and right of C6/C7/T1 and T4–T7. Her old back injury pain has returned with pain across L3/L4. She has had a background headache for days and a constant feeling of a lump in the throat, worse when swallowing.

She finds it extremely hard to get comfortable at night, many times having to sit up because of 'unbearable' thoracic and C/T1 pain which aggravates her headache. She has noticed tingling in all fingers, right hand slightly worse than left.

She wears a scarf wrapped around her neck and reports wearing an old neck collar at night.

On assessment all movements look very painful and limited; undertaken with caution and muscle guarding/spasm.

There are no red flags. Her reflexes are normal, and lateral movement of the hyoid bone, cricoid and thyroid cartilages are normal though painful.

When asked what would happen if she moved further she says the pain would be unbearable – she has experienced moving too quickly too far: 'I don't want to do that again!' She admits to being concerned about further damage: she's sure the original accident tore muscles and damaged joints or the discs 'it hadn't hurt much to start with, so I must have been in shock'. She thinks the tingling in her fingers means she probably has trapped nerves.

She admits to getting down about the pain: the lack of sleep, worries about the effect on her work, wondering how long it will go on for, and whether it will ever get better. This is the first time she has felt down like this.

Treatment

- Reassurance that her neck is healthy, just very sore as she has been in an RTA. Similarly the muscles at the front of her throat would have been yanked on as her head was not fully stopped by the headrest.
- Acknowledgement of her pain: muscle spasm can be extremely sharp and painful, and pain and sensitisation following injury is normal but pretty unpleasant. Her throat likewise is normal; the lump will be the sensitisation as well as perhaps some muscle spasm though this should settle when normal movement is regained.
- Given a brief explanation of post-injury sensitisation in the CNS, and that the neck is immensely strong: touch and normal movements are not damaging even after a whiplash. The pain is not a sign of further damage; pain worse later rather than immediately is hypersensitivity – just as happens with sunburn. The process of healing briefly explained, with the need for gentle then progressive movement to reduce pain, limit stiffness and muscle spasm and encourage strong repair.
- She is now at the subacute stage however so encouraged to start moving as normally as possible, as this would NOT cause more damage and would help speed up tissue recovery. Taught to do gentle relaxing movements to other joints first then to the affected joints: helping the muscles to be more relaxed when beginning painful movement. Now it is not acute she is encouraged to try out both heat and ice: which works best to reduce the pain and spasm? Encouraged to build up her general activity: take the stairs to her 4th floor flat, not the lift.
- Since immobilisation increases pain and encourages muscle spasm on movement, she was praised for getting up in the night and encouraged to use this, together with relaxation and regular changes in position as a strategy until the pain eases further. Her sleep is interrupted so she was reassured relaxation and rest are almost as good and she would soon find she could sleep for longer.

Reviewed in 1 week

- 'I don't know what you did last session, but I felt like a massive weight was lifted and I felt happy again. Even though the pain is there, it doesn't worry me'.
- All neck movements nearly full, just slightly stiff. The lump in her throat has diminished: shoulder range of movement has doubled with much less tension/caution.
- Normal treatment commenced: yellow flags are no longer an issue. Mobilisations help movement further but are always linked to relaxed movements she can do herself that relate to function. She is taught to raise her shoulders into full elevation in lying to encourage relaxed movement with thoracic extension, and to lift light weights above the head (short lever) while standing. Lumbar flexion loosens after hip lateral rotation stretches followed by knees to chest in lying, then finally bending forwards in standing, knees straight (additional dural stretch; challenging old beliefs that bending at the back rather than at the knees is dangerous) and neck as relaxed as possible 'let your hair flop towards the floor'.
- Instant acknowledgement and reinforcement of each slight relaxation of muscles and movement in the direction required; mainly subtly but with a summarising positive verbal acknowledgement.
- Plans for graded return to work and her usual dance class.
  - How to set baselines when starting activities again
  - Discussion on pacing-up activities (move forwards from avoidance without boom then bust)
  - General exercise programme related to dance.

Conclusion

- Yellow flags are relevant in acute pain/injuries.
- Need appropriate screening and early intervention.
- Thorough assessment and self-management focus with simple treatment helps prevent chronic pain and disability.

Case Study 13.2 Behavioural experiment

Background

35-year-old woman with multiple unsuccessful surgeries for anterior knee pain. She is fearful of walking without the right knee brace provided by her surgeon. She reports many episodes of falling when walking and on the stairs, with lots of bruises and a broken wrist from falls. She has removed the brace to do floor or sitting exercises, but always puts it on for standing and walking.

Her right quads are moderately wasted; knee flexion 80°.

Therapist: 'Accepting that it will be painful and you'll feel very insecure, what do you

predict will happen if you walk 5 metres down this corridor without your brace?'

Patient: 'My knee will give way and I'll fall'. Her words are written down.

Therapist: 'What are your chances of falling?'

Patient: '100%'. Written down.

She agrees to do an experiment to test the prediction: to walk 5 metres without her knee brace then sit down.

While walking her knee is held straight, her gait unsteady and weaving. She sits down with difficulty, placing her hands on the chair seat as soon as she is within reach, turning to sit by hopping.

Patient: 'It didn't happen that time, but I know it would if I tried again'.

Therapist: 'How many times do you predict you would need to walk up that corridor without your brace on to guarantee to fall?'

Patient: 'Three'. Written down.

Therapist: 'Shall we test that prediction out? What are your chances of falling this time?'

Patient: '80%'. Written down.

The experiment is repeated and predictions recorded. After 4 experiments she walks with a smoother gait and sits down more normally. Her predictions of how likely she would fall have dropped to 30%. This is not remarked on. Instead she is asked for her views on her initial prediction of 100%, its accuracy and whether it had affected her confidence to try walking without her brace.

She acknowledges that her initial prediction turned out not to be accurate and that while she still feels anxious about walking without her brace, her anxiety is now less. She can see the 100% prediction had influenced her confidence before she started.

Therapist 'It seems walking in a straight line without your brace on doesn't cause you to fall, but what would be more of a challenge, cause your knee to give way and for you to fall?'

Patient 'Changing direction; turning round'.

Therapist: 'Okay, so if you were to stand here then walk to the right in a complete circle, what would happen?'

Patient: 'My knee would give way and I would fall; it doesn't like going to the right'.

Therapist: 'What do you predict are the chances of that happening?'

Patient: '80%'. Written down.

After one hesitant but successful walk around to the right:

Therapist: 'So how many times do you predict you would need to do it to guarantee that you would fall?' – and so on.

After six experiments the predictions are down to 30%. Although she limps sometimes when the weight goes onto the right leg and shows some anxiety, she has not fallen.

Therapist: 'What would you worry about doing at home without the brace?'

Patient: 'The stairs!'

Therapist: 'What do you predict would happen if you went up the stairs without your brace on?'

Patient: 'My knee would give way, I would slip and fall; I've fallen on them before.' Written down.

Therapist: 'How about testing that prediction out just like we did today? You can ring me in 2 days to tell me how it went. Here is the prediction and conclusion sheet to fill out.'

In view of the limited knee flexion and fear of falling it can be predicted that stair climbing will initially involve hip hitching, general muscle tension and behaviours associated with pain and fear. The patient, however, knows how to perform a behavioural experiment and in doing so and repeating the task much of this behaviour reduces, particularly since at each review you focus on her achievements. She now has ownership of improvement and receives the credit for it. With a little guidance through Socratic questioning, the final few details to regain normal stair climbing, and with it improved knee flexion, can be achieved.

Considering her surgery, how much knee flexion, can be regained is difficult to predict. Give her some time to work on her function by challenging any residual fears (help her to keep moving the goal posts) and surprise you!

Case Study 13.3 Pain management

28 year old roofer. Lives alone, ground floor flat

Injury at work 4 years ago: fell backwards down narrow staircase. Remembers "bouncing off the walls". Undisplaced #C4+5, L3+4.

For 4 years not worked, climbed stairs, crouched, bent, knelt, got on the floor or into a bath. Always uses elbow crutches

- To reduce pain on WB left leg.
- "Takes pressure off my back".

Values

- Work: reflected how much of himself he has lost through not working.
- Social life.
- Being fit.

Goals

- Go back to work: "roofing may be too much" but wants to go to college or find other work.
- Get off crutches; go down the pub with his mates without them.
- No fitness goals at present; seems impossible, but loved golf and football.

Objective – salient points

Walking: 2 elbow crutches, 10° fixed flexion left knee to max 30°, NWB left heel.

Stairs: anxious, especially going up, managed 4 steps pre-treatment assessment (right leg up, left leg down).

Treatment

Pre-programme practice: 4 stairs (neighbour's) 2-3 × daily.

1.1 *4-week pain management programme*: General circuits and stretches, including stairs (4 stairs using both legs + handrail/wall), getting onto the floor, 'kneeling' PWB left knee, but not exercise bike: insufficient left knee flexion. Using 2 crutches.

1.2 **Review after 1 week.**

Increased pain experience

- "Only just managing" with current pain levels; "doesn't want any more".
- Now WB through left heel "due to stretch and my plan to put the heel down every 3rd step". Increased calf pain but it always settles: "okay training pain; necessary for getting the heel down".
- Knee pain though "not okay: burning, can't think of it in the same way". Not sure why and frustrating him. He really wants to work on this now, has progressed to bending 60°, but guarded.

Cost/benefit analysis for bending his knee

- "So I don't have to limp around with my crutches and can look normal – especially at the pub."
- "So I can go back to work."

Cost/benefit analysis for walking up & down stairs

- "So I can go back to work: give me more options."
- "I don't go out as I can't go upstairs to use the toilet. I once had to use a bucket in the garden. Awful."

How he manages increased calf pain with heel WB.

Breathing and relaxing.

1.3 Thoughts when he has increased knee pain

"I know pain doesn't mean damage, but I can't make myself go through it."

1.4 Has he ever tried staying with it? What happened?

Anxious, sweating, heart pounding; usually stops at this point. Reflecting on this, reported he'd never tested out what would happen if he stayed.

Key considerations

- Not just about feelings of anxiety, but also increased pain.
- Never tested whether anxiety or pain would continue increasing exponentially.

1.5 Week 2 Graded exposure

Preparatory fact finding discussion; principles explained

- Current pacing level for kneeling: 7 seconds. Not sufficient to provoke anxiety symptoms.
- Predictions about kneeling for longer
  - Predicted pain would increase immediately.
  - Didn't know how long he'd kneel for before feeling anxiety sensations.
  - Anxiety would definitely increase too, but confident both would return to usual levels if not done "too long".
- Reminded about opting-out any time.

Exposure

Explored 4-point kneeling, left knee 80° (predicted anxiety 40/100). Stayed 32 seconds, stopping because he couldn't tolerate the pain.

Wanted to try again as anxiety only 25/100. Did 4-point kneeling for 73 seconds. Went through waves of anxiety with tense hands but did breathing control: "It didn't increase!" Pain followed a similar pattern. Stuck with it for 3 more cycles: pain ISQ, settling quickly; anxious feelings to 10/100. De-briefed, but then got straight onto exercise bike, did 0.8km and said "I love it!" That weekend his mother gave him her's. Within 1 week peddling at aerobic level for 13 minutes. Maintaining kneeling with anxiety rating practice.

Other fears: going up stairs

Feels he "conquered that fear" day 1, but still anxious about narrow stairs: his original injury

setting. Thought the work on kneeling anxiety gave him the confidence to do the bike, but wouldn't help his fear of narrow stairs (still avoiding his mother's). Wanted to do them to reduce anxieties.

Graded exposure to stairs

Psychologist checked for flashbacks associated with stairs: essentially none. Fear hierarchy reviewed (Table 1).

Table 1 Hierarchy of fears

Wk 1	Wk 2	Wk 4	
100++	80	25	Walking up & down a flight of narrow stairs nobody around.
100	40	10	Walking up & down a flight of narrow stairs someone present.
90	30	10	Crawling on all 4s.
80	10	0	Kneeling FWB left knee.
70	0	0	Riding exercise bike.
60	10	5	Walking up & down 6 steps using both legs, no-one present.
50	40	15	Twisting the back while swinging a golf club.
40	5	0	Walking up & down 6 steps using alternate legs, someone present.
30	20	0	Walking 5 yards no crutches, PWB left heel.
30	0	0	Kneeling 10% PWB left knee, 30 seconds.
20	0	0	Walking 5 yards with crutches PWB left heel.
10	0	0	Walking up & down 4 steps no-one present.
5	0	0	Walking up & down 4 steps someone present.

Rating of anxiety with feared activities assessed end of week 1, week 2 (post-exposure work for kneeling, pre-exposure work with stairs) and end of week 4.

Physical outcome measures

	Pre-treatment	Last day	1-month follow-up	9-months follow-up
5-minute walk (m)	5	275	363	467
1-minute stand ups	3	13	22	34
1-minute stairs	4	76	100	139 (ran)

He decided on 4 stairs from 1st floor (physio present) down to the next landing, climb back up, then go down further and up. Relaxed and calm; predicted anxiety during 30/100.

After down and up 4 stairs, reported sweating but "that was okay"; anxiety 25/100. Repeated: 15/100; again: 10/100.

Requested doing it with the physio out of sight. Did it, "no problems"; anxiety 15/100.

Next tackled whole flight, (physio present). Anxious feelings prediction now 30/100; after 15/100.

Repeated with no physio present: anxiety prediction 20/100; after 15/100; after 2 more repetitions 10/100.

Couldn't think of stairs he'd avoid now. Said he avoided his mother's stairs before to avoid failing in front of the family; didn't feel he could go alone first time. Will try now.

Reflected afterwards "Nothing should stop me doing something. Every time I do things it's less and less of a problem; I realise I can manage."

Discharge achievements

- Not using crutches; walking pacing level 4 minutes, repeatable 5 times with breaks. Keeping one crutch at home for long distance walks. Went to 6 pubs and 1 club last night without crutches!
- In and out of the bath.
- Off all medication.
- Climbing 2 flights of stairs – no rails, normal pattern.
- Bending, crouching, crawling in preparation for work as estimator for fitting flooring, 3 hours twice a week.
- Tried golf club half swing; plans to do pitch & putt with 3 friends before follow-up.
- 1 minute dribbling a football; plans teaching neighbour's son football skills twice a week from next week.
- Thinking of doing college courses now not hampered by crutches.

1/12 follow-up

- Working 3 hours twice a week. Able to pace, move around etc.
- Thinks his big achievement is climbing stairs. On considering it, a little anxiety about narrow stairs, but just climbs them.
- Cycling 10k alternate days; already worn out one exercise bike!
- No crutch use.
- Teaching neighbour's son football skills weekly.
- Played golf doing half swings but increased pain: "golf involves so much twisting". Not done since but thought he may do more of the twisting stretches to build up.
- Future goal: play football. "There's no better way to get back than actually kick a ball around".

Asked why he thinks the best way to return to football is to do it, yet he's been put off

golf? Smiled; recognized the incongruity. “I know what to do. Definitely!”

Chapter 13 Pain management multiple choice questions

1. Who termed pain a ‘need state’?
   a). Ronald Melzack
   b). Patrick Wall
   c). David Butler
   d). Lorimer Moseley
2. Which of the following is not recognised as a factor that will alter pain perception?
   a). Beliefs
   b). Culture
   c). Gender
   d). Environment
3. What is the timeframe for defining chronic pain as proposed by Gordon Waddell in ‘The back pain revolution’ (2004)?
   a). 12 weeks
   b). 16 weeks
   c). 6 weeks
   d). 10 weeks
4. What is a commonly recognised timeframe for defining chronic pain used in practice?
   a). 6 weeks
   b). 6 months
   c). 12 weeks
   d). 8 weeks
5. Allodynia is defined by which of the following?
   a). A nociceptive state as a result of repeated injury
   b). Damage to the nerve itself producing neural symptoms
   c). A nociceptive sensitivity to nicotine that presents in heavy smokers
   d). A state of hypersensitivity
6. Which of the following is classified as a cause of neurogenic pain?
   a). Osteoarthritis
   b). Work-related upper limb disorder
   c). Low back pain
   d). All of the above
7. Which of the following is a recognised method of measuring pain?
   a). Shuttle walking test
   b). McGill pain questionnaire
   c). Numerical rating scale
   d). HADS
8. Which of the following is not recognised as a measure of depression?
   a). DAPOS
   b). HADS

c). BDI
d). TURP

9. Catastrophising is where a patient...?
   a). 'Shops around' clinicians searching for a cure
   b). Has a negative outlook
   c). Believes they have a life-threatening illness
   d). Always seems to get injured if they participate in a physical activity

10. Which of the following statements is incorrect?
    a). Those who regularly take analgesia or other psychoactive drugs like alcohol may require higher doses
    b). Care is taken that patients do not take doses that put kidney or liver function at risk
    c). Do not use NSAIDs or larger doses of opiates with the over 70s
    d). Pain relief is enhanced in those who regularly take analgesia or other psychoactive drugs

11. Which of the following may help a patient to deal with their pain?
    a). A diagnosis, e.g. slipped disc
    b). Informing them that it may never resolve
    c). Information about the inflammatory process and usual duration
    d). Knowing the difference between NSAIDs and opiate medication

12. Which of the following is least likely to lead a patient into a chronic pain state?
    a). Avoidance of activity when the pain occurs
    b). Forcing activity, whilst ignoring pain, no matter how strong
    c). Being told by their therapist that the pain 'is not that bad'
    d). Management of avoidance behaviour at the earliest opportunity

13. Physiotherapists can influence depressive behaviour by which of the following?
    a). Advising the patient to take more pain medication
    b). Ensuring the patient feels believed
    c). Advising the patient to go to their GP
    d). Telling them that they will get better one day

14. Improvements are seen in patients with chronic low back pain if...
    a). Pain is discussed and analysed
    b). Pain is ignored
    c). Praise is given rather than criticism
    d). Pain is logged in a diary

15. Which of the following would not be classed as a value domain?
    a). Family relationships
    b). Health/physical well-being
    c). Education/learning
    d). Pain perception

16. Pacing is...
    a). The steady build-up of an activity

b). Guided by the onset of pain in relation to activities
c). The process of avoiding rest to build up activity
d). A process that requires a therapist to set the goals

17. Which of the following would not be classed as an unhelpful cognition?
a). Focusing on one negative feature in a situation
b). Believing that others think negatively about you
c). Believing things are worse than they are
d). Not worrying what others think about you

18. Which of the following are components of the graded exposure approach to pain management?
a). The importance of facing feared situations
b). Understanding that avoidance is the main contributing factor
c). Prepare patients for the tendency for fear/anxiety feelings to return
d). All of the above

19. Which factor is least likely to present in an individual with chronic pain?
a). Reduced level of housework or DIY activity
b). No longer finding it easy to do things
c). Decreased pleasurable and social activity
d). Being driven to achieve a task

20. When approaching the management of a patient with pain as the main problem which of the following is not a helpful strategy?
a). Using active listening skills
b). Using operant principles when getting patients to practise motor skills
c). Focusing on achievement
d). Ensuring the patient knows they are being treated by an expert

Pain management multiple choice answers

1. b)
2. c)
3. c)
4. c)
5. d)
6. d)
7. c)
8. d)
9. a), b)
10. d)
11. c)
12. d)
13. b)
14. c)
15. d)

16. a)
17. d)
18. d)
19. d)
20. d)

Chapter 14

Rehabilitation

Introduction

- Rehabilitation has many definitions, most of which include the terms optimising function, multidisciplinary, quality of life and patient-centred (Sinclair and Dickinson 1989).
- It might be helpful to consider the word as an umbrella term covering many aspects of patient care.
- Traditionally rehabilitation has focused on the restoration of function as seen in many areas of sports medicine where full recovery is anticipated.
- Many of the patients that physiotherapists work with have progressive long-term conditions where the nature of the injury or illness results in a permanent changes in the structure and function of the body (impairments) (DOH 2005, WHO 2001).
- All therapists will encounter patients where age-related changes have occurred, some of which may be irreversible.
- In these presentations the restorative approach cannot fully meet the needs of the individual.
- Contemporary rehabilitation needs to be able to cover a range of care aims that together make up holistic patient-centred rehabilitation (Table 14.1).

Table 14.1 Holistic patient-centred rehabilitation

Rehabilitation focus point	Intervention and treatment possibilities
Assessment and review	Use ICF to identify the impairments and activity limitations and participation restrictions to ascertain the nature and severity of the presentation
Empowering	Education and support to individuals and their carers about the situation to allow them to take an active role in their care
Supportive	Provision of appropriate support strategies to help the patient and family cope with their condition/presentation
Restorative	To promote/encourage/facilitate improvement in function for patients with new deficits resulting from a disease process, trauma or surgery
Maintenance	Provision of treatments, equipment, care and guidance to maintain gains made by the individual
Preventative	Anticipation of potential complications and difficulties

Palliative	To improve comfort and reduce discomfort, e.g. pain
Enablement	To maximise the use of existing functions
Conditioning	To improve endurance and strength in activities for patients who have become de-conditioned by poor nutrition or prolonged acute/chronic illness

Rehabilitation of patients with neurological presentations

- The rehabilitation of patients with neurological issues will require the physiotherapist to follow a problem-solving, multidisciplinary approach in order to ensure that the patient receives effective management.
- The principles of assessment, team working, patient-centred care and goal setting will assist the physiotherapist to develop a timely, appropriate, patient-centred treatment plan for the rehabilitation of each patient.
- It is important to remember that treatment and intervention can be required at any stage in a person's life. Rehabilitation may be needed following an injury and initial diagnosis or for many reasons including end-stage palliative care.
- Treatment can be provided in a variety of settings including outpatient clinics, acute hospital wards, intensive care units, community day hospitals, schools, at work and in the home and private services.
- Many of the patients and their families or carers will have encountered many different health care professionals and will have become experts in their condition. They may be seeking advice and guidance on how best to manage their condition at any one time. Long-term conditions require long-term management.
- Working in partnership and listening to what the patient says are essential to the effective management of their problems. As the expert in physical therapy the physiotherapist will be able to identify appropriate treatment or care plans with the patient, based on the findings of the assessment.
- The individual may require the services of several different members of the health and social care team at any one time, therefore the skill of the individual member of the team is to identify the most appropriately skilled health or social care professional for each patient. This requires ongoing communication over time, across service settings, with the need to access reviews both in the community and in the hospital being integral to the patient's programme of rehabilitation.
- It requires health care professionals to have a knowledge and understanding of what their colleagues can offer and how to access their services and how to make onward referrals.
- In summary it's about accessing the right services at the right time. Physiotherapy is often only part of the solution.
- Using a case history and referring to the International Classification of Function (ICF) the physiotherapy management of a patient presenting with neurological problems will be

outlined in the following section (WHO 2001).
- To ensure that each patient has an appropriate treatment plan all of the components of the ICF must be included in the assessment.

ICF-based patient case study

- A 28-year-old male suffered a traumatic brain injury following a road traffic accident.
- He underwent neurosurgery to remove an intradural haematoma and suffered further anoxic brain damage during a postoperative cardiac arrest.
- Initially he was intubated and ventilated for 2 weeks and then had a tracheostomy.
- He had abnormal levels of consciousness for several weeks with a fluctuating Glasgow Coma Scale score ranging from 3/15 to 9/15 (Teasdale and Jennett 1974).
- He was weaned off the ventilator after 1 month, spontaneously breathing and opening his eyes.
- He had poor swallowing ability and dysarthric speech.
- A percutaneous endoscopic gastrostomy (PEG) was inserted to maintain his nutritional status (Kirby et al 1991).
- He was managed on a general neurological ward for 8 weeks and referred for rehabilitation.
- Following this he was transferred from the acute hospital setting to a specialist neurological rehabilitation inpatient setting with the PEG in situ.
- At the point of discharge from the acute setting the tracheostomy was removed and some verbal output was noticed with single words being uttered.
- Abnormal tone was present in all four limbs and he was unable to move independently in bed, e.g. rolling, lying to sitting.
- He demonstrated no ability to balance in sitting and had poor head control requiring specialist seating and support.
- Then followed 18 months of inpatient rehabilitation, involving specialist seating, splinting, swallow assessments, the use of communication cards, prevention of contractures, maintenance of range of movement, control of movement and strengthening.
- He was then moved into a long-term residential placement for fully supported living and was dependent for all personal activities of daily living.
- At this point he continued to need the PEG to maintain adequate nutrition, but was starting to take oral food and fluid as his swallow had improved.
- Behaviourally he often spat out drinks and would not take adequate volumes to maintain hydration.
- After 6 months in his long-term residential placement his family requested that he return home with support from health and social services.
- At this point 27 months after the initial injury the social worker who was supporting the re-settlement into the community requested involvement of the community rehabilitation team and made a referral to physiotherapy.

Assessment of the patient (using the ICF classification model)

See Tables 14.2 and 14.3.

Table 14.2 Body structure and function, activity and participation

Impairments (body structure and function)	**Activity limitations**	**Participation restrictions**
Limited concentration Behavioural issues, shouting out	Difficulty following commands and listening	Limited options for social interactions. Unable to get outside bedroom easily
Poor memory Dysarthric speech Poor planning	Difficulty communicating his needs	
Slow oral phase of swallow	Difficulty learning new tasks Unable to maintain fluids without use of PEG	Difficulty getting carers that will look after the PEG site
Abnormal voluntary control of his trunk	Unable to sit independently without full support	Fully dependent for all activities of daily living
Abnormal voluntary control of his hands	Unable to manipulate objects effectively	
Abnormal voluntary control of the left leg, extensor spasms	Unable to keep feet on foot plate	Has limited control over his environment
Contracture of the left foot into plantar flexion and inversion	Unable to be placed in a standing position	
Contracture of the right knee (30° flexion)	Unable to straighten the right knee to assist with washing and dressing	Unable to shower dependent on bed wash only
Incontinent of urine and faeces	Unable to toilet himself or indicate when he requires toileting	
Fear of new movement	Takes time to get to know new care staff	

Table 14.3 Contextual factors: environmental and personal

Environmental	**Personal**

Living in council accommodation in one room with hospital bed, hoisting equipment and specialist seating Supportive family with friends and relatives Lots of people coming and going visiting him Awaiting rehousing	Much loved by family and friends, young, full of energy, high spirits and lots of laughter Young man with a history of traumatic brain damage

Interventions and treatment plan

Prioritising the interventions

- Using the structure of the ICF gives an overall picture of the patient's issues and highlights the specific problems.
- The important issue for the rehabilitation team is to determine what they can influence most effectively and which area will have the biggest positive impact on the individual.
- Identification of which problem to tackle first may require careful discussion with the team and with the individual and the family.
- It is possible to work on several areas at once. Experienced clinicians will consider the risks involved in not addressing an issue and the consequence and likelihood of there being unacceptable risk if an area is not addressed.
- In this case the risks of social isolation, increasing frustration and disruptive behaviour as a result of being unable to access more than one room were deemed to be the priority issue.
- There was a high likelihood of isolation occurring and the consequences to the individual would impinge on his ability to improve during rehabilitation.
- The importance of giving him some control was also considered to be of high importance to facilitate improvements in his behaviour.
- Removal of the PEG was viewed as being low priority and low risk, but it was something that could have been addressed relatively easily.
- In summary, this case illustrates the type of patient that may be encountered and the multiple issues that they may be associated with. Logical organised assessment and effective communication with other team MDT members will ensure that patients receive an appropriate treatment plan and effective interventions.

Patient-centred care and team working

- Considering activity and participation issues in the case can be used to illustrate patient-centred care and team work.
- This young man is fully dependent on others and at the time of assessment had difficulty communicating his needs to others.
- There was fear and frustration present with evidence of behavioural issues.
- A patient-centred approach should explore the appropriateness of the environment, control over the environment and the communication difficulties and access issues.

Actions for the health team

- Submit reports to housing and social services to ensure client becomes a priority for re-housing. Information sharing between health and social services is important to ensure that the impact of the housing issue is understood in terms of its impact on the individual's potential for recovery and improved health status.
- These reports are best compiled as an MDT report.
- The physiotherapist information should focus on the mobility issues, e.g. wheelchair dependence and need for a hoist for transfers from bed to chair and chair to commode.
- The occupational therapist will report on other equipment issues, e.g. the need for a wet room that is wheelchair accessible, and that will allow a carer to shower the patient using a specialist shower cradle.
- The report will identify that the patient requires specific access in and out of the property to facilitate the care plan, which includes 3-weekly trips to a day centre for therapy intervention.
- Education and advisory role for the family, to explain why the patient needs accommodation that does not impose restrictions on the way in which he is managed at home.
- To review the need for a PEG feeding system.
  - The PEG feed was inserted over 2 years previously during his acute care in the hospital setting to maintain adequate nutrition, when swallowing and speech was negligible.
  - During the physiotherapy assessment of impairments, activities and participation it was identified that the individual was now taking in a reasonable volume of food and fluid.
  - The family reported that the PEG had not been reviewed for some time and at last review a decision was made to retain it in order to ensure adequate hydration due to his occasional refusal to drink.
  - For several months now he was taking oral fluids well with no issues.
  - The PEG had become an ongoing source of difficulties for the patient as it frequently became infected and sore.
  - A referral was made to the community dieticians for a review.
  - The Community team requested a review from the acute services who had put the initial PEG in situ to request if it could be removed.
  - This involved an assessment period where the PEG was not used to see if the patient would co-operate and tolerate taking sufficient oral fluids on a daily basis.
  - Speech and language therapists reassessed swallowing.
  - Once it was established that the patient could eat and drink adequately the PEG was removed.
- Control over the environment and communication of needs (Barnes 1994, Young 2003).
  - A detailed assessment of his cognitive ability, upper limb movement, trunk control, sitting postures and positioning was completed by the occupational therapist and

physiotherapist.
  - It was identified that a switch system might provide some control over the environment and assist with communication of needs.
  - The team contacted the regional environmental control assessment team for them to undertake a specialist assessment.
  - A period of training and evaluation was discussed with the family and a system was installed.
  - The patient's wheelchair was reviewed by the occupational therapy team and a suitable lap tray was identified on which the switch could be place. The system had facilities such as a buzzer system to call for help and assistance and the ability to control his music system enabling the patient to regain some control over his environment and care needs.
- During this time the patient was re-housed and further assessments for equipment needs to assist the issues the patient had with limited balance and mobility.
- A problem identified in the new accommodation was a difficulty with showering, the patient required 2-3 people to be able to shower due to the risk of slipping out of the shower chair.
  - The patient's sitting balance was re-assessed and identified as being a high risk.
  - Examination of a shower cradle, previously used in the residential setting, identified the need for this equipment to be installed in the patient's home.
  - The team ordered the equipment and then it was possible for the patient to safely shower with members of the family or 2 carers only.

SMART goals for the patient and his family

- To drink sufficient fluid over a 24-hour period to maintain adequate hydration on an ongoing basis.
- To be able to operate a lap switch when sitting in the wheelchair and be able to turn the television on and off consistently in 2 months time.
- To shower in safety with assistance of two people in 2 months time.
- The goal attainment scale was used to evaluate the input, with goals set and achieved (Turner-Stokes 2009).
- All the goals required input from the patient, family and team.
- The team worked together to share skills and knowledge for the benefit of the patient.
- The case is ongoing with long-term monitoring and support available for the patient.
- Chronic conditions require ongoing assessment, patient-centred goal setting and involvement of the multidisciplinary team.
- The goals need to be reviewed and progressed as needed following reassessment.

Treatment of complex trauma

- Rehabilitating complex trauma patients can be a daunting undertaking when the patient

presents with multiple injuries, both physical and psychological.
- This section provides an indication of the framework with which to progress the patient through the stages of recovery.
- Guidance is provided to assist the reader to recognise when it is appropriate to take the next steps in rehabilitation and when the progression has been too rapid.

Getting started

- The trick to getting this right is in the assessment, planning, and being logical in the way treatment is applied.
- Tips:
  - Be methodical and through and allow sufficient time
  - Write plans down (there is often too much to remember)
  - Goal setting initially with the patient is key, make sure this is managed in small chunks, ensure the patient knows what is happening
  - Set short-, medium- and long-term goals
  - Frequently reassess progress, record it and modify the programme according to the results
  - Think of the whole patient and do not get caught up focussing on one area
  - Do not let treatment preferences dictate how a patient should be treated
  - Uncertainty about how to tackle a problem should be managed by reading around a topic or asking for help
  - Do not try to ignore problems and hope that they will go away!
  - Accept limitations of knowledge and experience and accept help from others, who may be able to provide ideas that will provide inspiration.

Things to consider when planning a rehabilitation programme

Severity, irritability and nature of the problems

- Treatment should not:
  - Make the patient's symptoms worse
  - Make the patient more tired than is necessary
  - Make the patient feel that the mountain is too high to climb!

The ability of the patient to learn and retain information

- Have they had a traumatic brain injury?
- Are they able to process the information they have been given to aid their recovery?

- Are they able to remember the information, exercises and treatment in their planned programme?
- Is the medication they are taking having an influence on their mental state/memory /processing ability?
- There is no point in giving the patient verbal information if they have poor short-term memory, and are likely to forget.
- Think of the alternatives, e.g. write plans down, write instructions for exercises or provide the patient with pictures of the exercises they need to do.
- A good idea is taking pictures of the patient doing their own exercises using their camera or mobile phone, it can be a fun activity and helps to remind them what to do.
- They will need to provide consent for copies of the photographs of their exercises to be included in their patient records.
- Use visual cues to remind them to actually do their exercises or treatment, e.g. sticking post-its or coloured stickers around the room in key places, can help to jog the patient's memory.

Ensure the patient is ready to undertake treatment

- Agree the plan, stick to the plan initially and modify the plan if results are not forthcoming.

Key Points

Make sure that the patient is:

- not overtired
- not in too much pain
- in the right state of mind to progress

Goal setting

- The setting of long- and short-term goals and making them specific to the patient is key to achieving a successful outcome in rehabilitation.
- A problem-orientated approach to goal setting is most commonly used, with rehabilitation teams defining specific, measurable goals that have been developed in conjunction with the patient.
- Patients often pick a goal which is difficult to achieve in the short term, e.g. climbing stairs in their house, so they can go home from the hospital.
- Break down the task for them into smaller goals, which they can realistically achieve.

Goal-setting example

- To get up stairs a patient needs to be able to flex their knee and hip to 90°, currently they are able to flex to 20° in each joint.
- Grade 4 quadriceps, gluteal muscles and good balance are required to achieve this.
- Setting them a goal of increasing their ROM by 10° increments per week, their power and balance in similar increments, is achievable.
- If they are given a time line (Table 14.4), they will have an idea about how long it will take to reach their target.
- Warning! Before setting goals and targets are set ensure all pathology and healing times and possible setbacks are taken into consideration.
- If more than one pathology is in existence at any one time, things will often not go according to plan.
- It is essential to constantly reassess and redefine goals as necessary.

Table 14.4 Example of timeline for increasing functional activity in the lower limb

Today	2 weeks	4 weeks
20° at knee	40° at knee	60° at knee
Unable to use own strength to straighten knee	Can lift leg to 40° against gravity	Can lift leg to 60° against gravity
Unable to stand on 1 leg	Can stand on 1 leg holding on to support firmly	Can stand on 1 leg support through finger tips

5 weeks	6 weeks	Get to go home
Can do 5 step ups	Able to climb whole flight of stairs	

Stages of rehabilitation in complex trauma

Early stage

- Immediately following admission and in the early stages the patient may be unable to undertake an active part in the rehabilitation process, therefore treatment is concentrated around the following:

The vitals

- For example respiratory function.

Circulation

- Management of swelling, skin condition, prevention of breakdown and pressure sores.
- This should be aggressively managed.
- Consider pressure control measures and a positioning chart to aid nurses and to remind the patient to change positions.

Bed mobility

- Enabling the patient to do as much as they physically can, and teaching them tips and tricks to make moving around easier and more comfortable.

Maintaining joint range of motion (ROM)

- Using passive stretches and positioning techniques.

Offering psychological support

- Advice and reassurance should be offered early on.

Middle stage

- This period can go on for a very long time depending on the extent of the injuries, the complications and the patient's willingness to engage in treatment and work hard at it.
- This may be as an inpatient or outpatient and this stage requires regular revision of the patient's goals.
- Be prepared for setbacks that occur, e.g. poor healing in bones, skin or scars or even the need for further surgery.

End stage

- This is the most rewarding phase and yet the most difficult.
- It can require diplomatic discussions around the following:
    - Relationship issues
    - Plans for work or the future
    - Vocational plans/retraining
    - Plans for sports/running/adventure/travel and the opportunities available
    - The practicalities of living with disability
    - Driving.
- Team working is crucial at this stage, bringing in others, e.g. occupational therapists, who

have training in psychological support and vocational planning.

Key Points

- During the early stage of rehab be open and honest about what is realistic in the future.
- This is crucial, as not everyone will be able to be a paralympic athlete, and not everyone will go back to the job they used to do.
- Guidance in these subjects is key to being able to set realistically achievable goals that will not set the patient up for a huge disappointment in the future.
- Learning to balance between reality and overoptimism is a key skill for a therapist to acquire.

Importance of diet

- Provide the body with adequate energy during rehabilitation!
- Healing requires more energy than might be expected.
- It is appropriate to increase caloric intake to promote healing.
- Patients that have received traumatic injuries, e.g. fractures of the long bones, have an immediate increase in metabolic demands, that can translate into a caloric demand three times that of normal.
- Many patients will be undernourished when they get to see a physiotherapist, so they need education about their protein needs and calorie intake, and advice about how much and how often to eat in order to help the healing process.
- Boosting mineral intake can help with the healing process of the bones, muscles and skin.
- However care must be taken to ensure that the dosages are appropriate, especially in the presence of a head injury, when high doses may be toxic to the patient.

Promotion of the healing process

Smoking education

- A recommendation is that those who have traumatic injuries cease smoking for the full rehabilitation period; this is particularly pertinent for those with inhalation injuries.
- Current and previous smokers were less likely to achieve bony union than non-smokers and twice as likely to develop an infection.
- Previous smokers are 2.8 times more likely to develop osteomyelitis (bone infection) and soft tissue healing is adversely affected (Bartsch et al 2007).
- It is important to remember that alcohol intake has also been linked to similar problems in the healing of soft tissue following traumatic injury (Radek et al 2005).

Pain management

- It may be necessary to produce discomfort, as tight structures are mobilised and muscles are worked; however, it is important to know the difference between acceptable levels of treatment soreness and provoking the patient's symptoms.
- 'No pain, no gain' is not appropriate as a mantra to follow, just as it is impossible to effectively treat patients without inducing some soreness.
- Be conscious of the patient's symptoms and make sure they are working with the medical staff to take their medication correctly and they are being prescribed adequate levels to enable them to achieve the treatment goals.
- Always allow enough time for pain medication to work.
- Have a working knowledge of what they are taking to control the pain, when they took it and how long it will last.
- Do not start a treatment session if the pain relief is about to stop working or has not started to take effect.
- Plan ahead and make sure you work with the patient to get the most out of the time you spend with them, maximising your effectiveness.
- Ask the patient when they feel they are most awake, in the least amount of pain and most receptive and then plan the treatment time around this.

Key Points

- Make sure you understand what medication the patient is on, how it works and how long it takes to have an effect.
- Read around the subject and refer to the British National Formulary (BNF) to develop appropriate pharmaceutical knowledge.

Management of traumatised muscle

- Assessment of the strength of all muscle groups is essential for treatment planning.
- It is essential to ensure the muscle is fully innervated and the muscle is free from scarring in the fascia and skin that can affect joint motion.
- Some patients will have a huge loss of muscle bulk as a result of tissue loss and atrophy (Figure 14.1).

Figure 14.1 Soft tissue involvement in a traumatic injury.

Tendon damage

- Repair and treatment should include stabilising the tendon allowing it to heal, providing an environment to promote healing and reducing swelling in the area.
- Patients should be provided with a protocol and guidance for the rehabilitation of each tendon repair.

Muscle strength

- Muscle strength may be increased with progressive resistive exercise.
- The progression of strengthening exercises, from those provided for a flickering muscle (grade 1, Oxford Scale), through to the heavy loading that may be achieved at end stage rehabilitation will be determined by continuous assessment of the muscles and determining their ability to be able to benefit from working against a greater resistance or for a longer duration.

General conditioning

- Combine various exercises to treat the effects of debilitation, prolonged bed rest, or immobilisation.
- The goals here are aimed at re-establishing haemodynamic balance, increasing cardiorespiratory capacity and endurance, and maintaining range of motion and muscle strength.

Exercise considerations when planning the rehabilitation programme

Active and passive exercises

- Can overcome loss of articular and muscular movement.

Exercises performed independently by the patient

- Can improve circulation and metabolic improvement.

Exercises performed against resistance by a physiotherapist

- Counteract muscular atrophy and restore the neuromuscular memory.

For patients with a neurological injury

- Provide exercises that produce precise movements, using the whole kinetic chain.

Exercises for postural sequences

- Can help recover normal movement/motor memory, e.g. moving from sitting to standing.

Static-dynamic exercises

- Can be used to counteract hypertrophy and scar contractures, by using forces that release scar tension in a constant, continuous, and adjustable manner.

Proprioceptive neuromuscular facilitation (PNF)

- Can help to re-establish functional patterns of movement.
- Table 14.5 indicates the types of exercises that can be used for a patient who has sustained a mild head and soft tissue injuries.
- Each exercise should be specific to the patient and have purpose, direction and be graded at the correct level, so that the patient may achieve their goals within the projected timeframe.

Table 14.5 Example of exercises for patient with mild head injury and soft tissue trauma

Assessment findings	Type of exercise to consider
Quadriceps power, Oxford Scale Grade 3	Resisted knee extension Thera-band Ankle weights PNF half leg patterns Hydrotherapy buoyancy resisted knee extension Kinetic control and muscle balance exercises

Poor balance and proprioception in standing	Balance exercises in different positions with eyes open and closed Wobble board exercises and games PNF Nintendo Wii Fit
Unable to sit to stand with normal movement	Normal movement/Bobath techniques
Low endurance for walking and results for multistage walking/'timed up and go' test poor	Paced walking programme Gentle cardiovascular programme, including swimming, cycling and aqua jogging, with heart rate at 60% of maximum

Key Points

- The use of gravity-assisted, eliminated, gravity-resisted, moving on to weight resisted exercise is vital to the patient's progression.
- The same progression should be applied with balance, hydrotherapy and cardiovascular exercises.

Management of the skin

- Skin is nearly always affected in trauma and excessive swelling and oedema, and open wounds can all cause scarring (Figure 14.2).

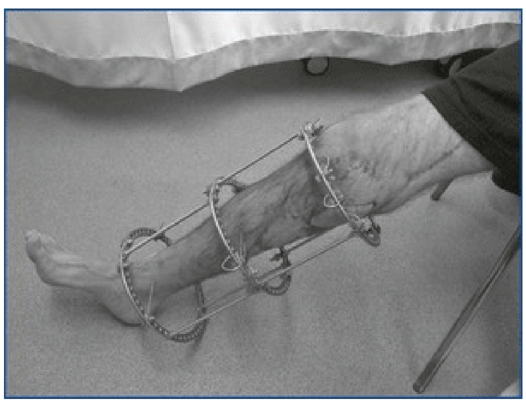

Figure 14.2 Extensive lower limb damage and scarring.

Oedema

- Control oedema using the RICE principles, 'Cryo-Cuff' or 'Game Ready' if available

(www.cryocuff.com, www.gameready.com).
- Reducing oedema can result in reduced scarring, improve joint function and ease pain.
- Consider using graduated bandaging, tubigrip and pneumatic pressure therapy.

Scars (Figure 14.3)

- Patients will often present with multiple scars, which will respond to different treatment modalities, that may include manual therapy, electrotherapy, the application of gels, lotions, splints and bandaging.
- Refer to Chapter 4 in this volume and in Volume 1.

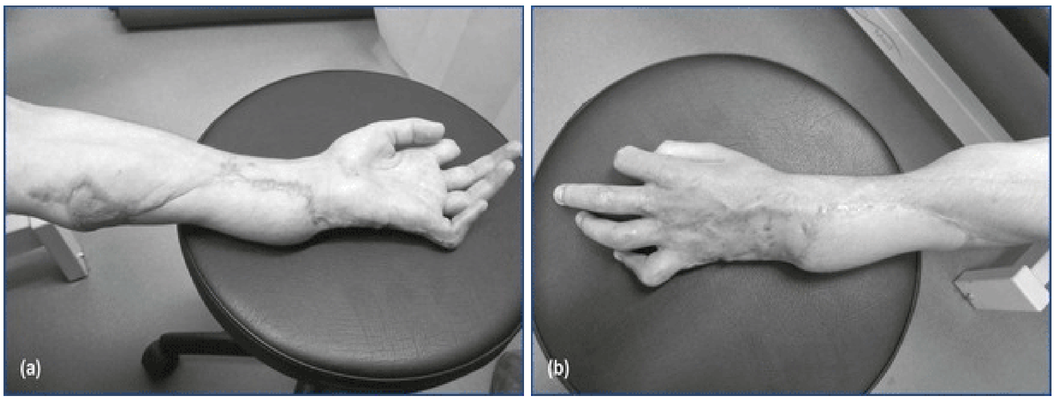

Figure 14.3 (a and b) Extensive skin damage and scarring.

Management of nerve injuries

- Nerve injury is divided into peripheral and spinal, with some patients presenting with a combination of both.

Assessment of the ongoing recovery of peripheral nerves

- Testing the muscles which are innervated by recovering nerves informs the treatment plan, especially the progression of exercises for the involved muscle groups.
- Examples of treatment modalities for recovering nerves are outlined in Table 14.6.
- Patients that sustain a spinal cord injury are treated in specialist units.
- The reader is referred to the assessment volume chapter on spinal injuries and to the treatment chapter in this volume.

Table 14.6 Treatment interventions at each stage of nerve recovery

<table>
<tr><th>Activity of muscle</th><th>What to try</th><th>Results</th></tr>
<tr><td rowspan="3">No muscle activity</td><td>Splint and protect the area</td><td rowspan="3">Soft tissue remains in good position and does not contract during the period that the nerve is recovering</td></tr>
<tr><td>Refer to a peripheral neurologist for further assessment, e.g. nerve conduction studies</td></tr>
<tr><td>Educate the patient about the healing process</td></tr>
<tr><td rowspan="7">Flicker of activity in the muscle</td><td>Continue to splint and protect</td><td rowspan="2">Maintains soft tissue in a good position and prevents contractures</td></tr>
<tr><td>Active assisted exercise</td></tr>
<tr><td>Gravity/buoyancy assisted exercise</td><td>Exercise helps normal movement to occur</td></tr>
<tr><td>Functional electrical stimulation (FES)</td><td>FES encourages nerve activity in the recovering nerve</td></tr>
<tr><td>Adverse neural dynamic exercises (AND)</td><td>Encourages neural mobility</td></tr>
<tr><td>Soft tissue work around the area of the suspected interface of nerve and restricted tissue</td><td>Allows soft tissue to move freely</td></tr>
<tr><td>Normal movement exercises</td><td rowspan="4">Normal return to function</td></tr>
<tr><td rowspan="3">Grade 3 and higher muscle activity through Range</td><td>Resisted/buoyancy resisted exercises</td></tr>
<tr><td>Progress to functional exercise</td></tr>
<tr><td>Increase the range of AND exercise</td></tr>
</table>

Hypersensitivity and allodynia

- Can be treated by using:
  - Neural suppressing drugs (medical team involvement required)
  - Desensitisation techniques – using different textures, temperatures and constant stimulation of the skin
  - Contrast baths
  - Acupuncture
  - Neural mobilisations
  - Pain management education.
- If a nerve reconstruction has been performed, guidance should be sought from the consultant as to when to remove the splint and when to start stretching and mobilising.

Psychological management

The use of imagery

- Imagery involves the use of several techniques and may be referred to as guided imagery,

mental rehearsal or self-hypnosis.

- This involves the patient creating mental images, feelings and sensations related to a desired outcome, as though it is actually happening or has happened.
- An analysis of the use of imagery by injured athletes concluded that 'The implementation of imagery alongside physical rehabilitation should enhance the rehabilitation experience and, therefore, facilitate the recovery rates of injured athletes' (Driediger et al 2006).

Characteristics of patients who recover faster (Michaels et al 2000)

- There are identifiable differences between people who recover quickly and those who don't.
- They:
  - Take personal responsibility for their recovery process
  - Have high motivation, desire and determination
  - Have excellent social support
  - Maintain a positive attitude
  - Frequently use imagery and other visualisation techniques
  - Expect a full and successful return to functional activities.

Positive effects of using imagery (Driediger et al 2006)

- Injured athletes, cancer patients, and those undergoing physical rehabilitation indicate that the use of imagery:
  - Increased feelings of control
  - Increased rate of healing
  - Increased ability to cope with therapy
  - Increased motivation to participate in self-care
  - Improved mood
  - Improved quality of life
  - Decreased post-operative pain
  - Decreased post-operative anxiety
  - Decreased amount of pain medication taken
  - Reduced length of time in the hospital.

Application of imagery

- If a patient wants to climb the stairs, get them to imagine that they are at the bottom of the stairs looking up.
- Ask them to close their eyes and picture in their mind's eye, either themselves doing the task, or watching themselves doing the task, as if seeing it happen on a television screen.
- Talk them through the process of what they would feel under foot, how they should feel

their leg move up onto the step, what they would see, what they would hear and even what they would smell.

- Get them to rehearse this in their head before they start the task, as it will help the process to happen more naturally.
- Telling them that top professional golfers use the techniques to control the 'yips' (a state experienced by golfers that causes them to miss important shots), this may get them to buy into the concept of imagery.
- You can use it for any movement that they need to practise.

Other psychological techniques

- Other techniques which can be used to good effect in the rehabilitation of the trauma patient include cognitive behavioural therapy (CBT) and eye movement desensitisation and reprocessing (EMDR).
- These skills are specialist in nature and require additional training.

Post-traumatic stress disorder (PTSD) and other associated issues

- Being aware of the psychological effects of trauma, including adjustment stress, anxiety and the effects of minor traumatic brain injury is crucial.
- If you become aware of problems, refer on to a specialist, such as a community psychiatric nurse (CPN) or a psychiatrist.
- There are many organisations such as 'Changing faces' and 'Combat Stress' who can help patients with adjustment to disfiguring injury and PTSD.
- Patients present in lots of different ways if they have PTSD, often they are angry and aggressive, pick arguments with their friends and family and use alcohol or drugs to help them sleep or just 'forget'.
- They can have poor concentration, are withdrawn, have low mood and often report that they get flashbacks or nightmares.
- They are often hypervigilant and sleep very poorly.
- If the symptoms are going on for longer than 6 weeks and are not improving further help should be sought from a professional in this field.
- Often the only person they will tell is their physiotherapist and you should act before the situation deteriorates.

Key Points

- Refer the patient to a specialist if psychological problems are suspected
- Consider CBT to enhance the rehabilitation
- Remember this chapter provides preliminary guidance, further reading will enhance your knowledge base and your ability to manage your patients more effectively

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Treatment of the musculoskeletal sports patient

Introduction

- Rehabilitation of a patient with a musculoskeletal sports injury encompasses a wide range of presentations from a grade I calf strain to a dislocated shoulder.
- The process of taking an athlete from point of injury to full fitness has many points to consider:
  - The journey usually starts with 100% treatment and 0% rehabilitation and then gradually over time this ratio changes to become predominantly rehabilitation.
  - There is always a need for active treatment, e.g. to maintain range, reduce morning stiffness and to assess progress. Even when the athlete has been back in full activity for some time, daily assessment and treatment may still be needed.
  - The process of progressing a patient through a rehab programme can be monitored using a traffic light system for daily assessment (the reader is referred to the assessment volume for details of this process).
  - Historically patients have been treated with a period of rest, followed by activity where rehabilitation is introduced. However, for an athlete rehabilitation can, and should be started as soon as possible.
  - This can start with simple bed exercises, e.g. isometric toes, ankle and quadriceps contractions to aid blood flow or the use of an arm ergometer, sitting down boxing, static bike work. This early work is important both physically and mentally for the athlete.
  - Following the ethos that every injury is an opportunity to return stronger, faster, fitter, more agile, more stable and less likely to get another injury puts a positive spin on an injury, it shows the athlete from an early stage that they will be considered holistically as an athlete and not just a hamstring tear for example.
  - An injury can often give an opportunity to correct other issues, such as poor core stability or muscle tightness in other areas.
- Early, mid and late stages of rehabilitation will be considered under the following headings:
  - Joint homeostasis
  - Range; joint movement and muscle length
  - Strength
  - Restoring balance
  - Restoring function.
- It is not to provide the rehabilitation pathway for all injuries but the reader is provided with a framework which can be used to help plan and develop a rehabilitation programme for an athlete with any injury.

Early treatment phase

- The priorities in this phase are homeostasis and range of joint movement and muscle length.
- The early phase has no timeframe, it starts as soon as the injury occurs and never really finishes, because even at end stage rehabilitation modalities used in the early stage may also continue to be required.

Injured area homeostasis

- Following an operation or after any injury, the initial phase concentrates on creating an environment which is optimal for healing and stopping further cell damage, this is often referred to as homeostasis.
- This involves the use of PRICE (protection, rest, ice, compression and elevation) to avoid further injury (ACPSM CSP 1998).
- The protection element puts the injured area in a position which avoids undue stress that could disrupt the healing process and it also helps with pain control.
- This may involve the use of a sling, splints or crutches or simply advice on what movements to avoid.
- Rest is very much associated with protection, and avoids placing undue stress on injured tissues which may disrupt the early elements of tissue repair.
- Rest can also reduce the metabolic demands of the injured area and thus aid healing.
- Advice on why this is important must be given as the athlete may want to get back to training.
- Ice is used initially to provide some pain relief and to set up a hypometabolic state which has been shown to reduce secondary cell damage (Fevre 1998).
- There is debate about how best to apply cryotherapy.
- Currently, 10 minutes of ice massage followed by 10 minutes rest and then another 10 minutes of ice massage seems to be the popular method.
- Compression can be in many forms, e.g. strapping or elastic bandages.
- It is used to limit the amount of oedema caused by exudation of fluid from the damaged tissue.
- Elevation of the injured body part lowers the pressure in local blood vessels and helps to limit bleeding, it also aids the drainage of inflammatory exudates through the lymph vessels.
- This element is often more important for lower limb injuries, the injured area should be placed so that it is above the level of the heart.
- Visiting the athlete at home can be important at this stage to ensure that they are resting appropriately.
- Accurate diagnosis can be difficult due to swelling and pain, therefore the position of rest may have to be maintained for the initial 72 hours until an accurate diagnosis and treatment plan can be made.

Range: joint movement and muscle length

- The final goal is for the athlete to resume full activity in their sport.
- In the early rehabilitation phase full range of the affected joints or full mobility of the affected muscles and neural tissues must be achieved.
- To start this process some Cyriax grade 'A' mobilisations (Kesson and Atkins, 1998) or Mulligan mobilisations with movement (Mulligan 2010) can be used, these active assisted movements are pain free.
- To progress the treatment passive mobilisations can be introduced to improve both accessory and physiological movements.
- Where appropriate some stretching techniques may be included at this stage.

Strength

- One of the main issues post injury is the loss of muscle strength.
- This occurs quickly due to pain inhibition and joint oedema, therefore as soon as possible isometric contractions should be undertaken and exercises for unaffected areas should be carried out to prevent muscle atrophy and to help maintain a positive psychology in the patient.
- Isometric can be progressed to concentric contractions and manual resistance can be a good way to start muscle activity, as the therapist can feel the quality of the muscle contraction and can carefully increase the work load.
- If the injury is a lower limb injury exercises can be carried out on the non-injured leg as this will facilitate strength development.
- If the injury is an upper limb injury then the non-injured side can be worked and of course the lower limbs.

Balance and function

- This area of treatment may be more difficult to begin as early as improving range or strength, but balance can begin with the facilitation of joint position sense.
- Depending on the injury and the functional status it is good to get the athlete moving about as soon as possible in a professional setting.
- A home visit can be useful early on and it can also be good to get the athlete to their usual place of work and environment to aid recovery enabling them to feel part of a group.
- In this period the athlete can watch videos with a coach which can be useful for skill development and psychologically to make the individual continue to feel part of a team.

Mid treatment and rehabilitation phase

- This phase is where joint homeostasis and range, i.e. joint movement and muscle length become less of a priority because the goals will have been successfully achieved earlier in

the rehabilitation process.
- The range and muscle length will need to be checked on a regular basis and maintained.
- Joint homeostasis will need to be monitored after an increase in work load or a change in work, as it is these changes which can upset the homeostasis.

Strength

- The approach to treatment or rehabilitation is very individual and strength training in particular can be carried out in many ways.
- A progressive system of stages can be very good, this means that every exercise that is chosen is progressed only after assessment and when the athlete can complete the exercise in a satisfactory manner (Table 14.7).
- An exercise is chosen and to begin with there will be no weight and nothing else to concentrate on.
- This simple exercise requires the patient to demonstrate good control and movement patterns (level 1).
- When this is achieved some loading can be added (level 2)
- When this is achieved this load may be increased (level 3).
- When the exercise can be carried out with some load or resistance then a proprioceptive challenge can be added and at the same time the load is removed (level 4).
- When the balance challenge can be achieved with ease the load is reintroduced (level 5).
- The balance challenge and load can be gradually increased (level 6).
- The final stage involves the patient undertaking the exercise with a balance challenge, load and with an extra demand being introduced (level 7).
- Levels 1 to 3 are considered to be mid phase, as they are concerned with quality of movement, range of movement and control.
- Levels 2+3 are concerned with keeping this quality of movement as load is introduced and gradually increased.
- Level 4 is the transition zone where the load is removed and the quality of movement is subjected to a balance challenge.
- The introduction of a balance challenge to these exercises is where there may be some overlap of the areas of rehabilitation.
- The balance challenge can be the introduction of a gym ball into a Bulgarian squat avoiding the patient lying on a hard surface or it can be performing a gluteal bridge, moving from 2 legs on the ground to 1 as the gluteal bridge progressions show (Table 14.8).
- Levels 5 to 7 make up the late phase.

Table 14.7 Table to demonstrate the progressive system for developing exercises

Mid Rehabilitation Phase			Transition zone	Late Rehabilitation Phase		
Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Exercise	Exercise	Exercise	Exercise	Exercise	Exercise	Exercise
	With load	Increase the load	No load	With load	Increase the load	With load
			Balance challenge	Balance challenge	Balance challenge	Balance challenge
						An extra demand

Table 14.8 Examples of how the progressive system can be incorporated into exercise provision

Bulgarian squat	Add weight	Increase weight	Back foot on gym ball, no load	Back foot on gym ball, with load	As level 5 and Increase the load	Add in front foot on bosu
Double leg gluteal bridge	Add weight	Progress to single leg, free leg held still	Single leg, free leg counter movement	Add load	Foot on floor, now on a ball	After a set have to jump up and run
Bench press	Add weight	Increase weights and reps	Gym ball under back	Single foot on floor	Foot on floor, now on a balance disc	After 1 set get up and do another exercise

Restoring balance and restoring function

- This is the area of rehabilitation where all the other factors required for success are needed, e.g. the use of pool sessions, balance training, jump work, movement work, and resistance band work.
- As for rehabilitation of strength the use a progressive system of stages is used.
- An example of balance training is outlined in Table 14.9.
- The example in Table 14.9 demonstrates the progressive system for balance training, where instead of introducing different exercises or different loads as happens in the development of strength, the balance work uses the same exercises, with the use of equipment being progressed.
- Level 1 may start in double leg stance with the patient catching a ball on firm ground, which may be progressed to being performed on a trampoline.
- Level 2 progresses the work on a trampoline to single leg movements such as toe touch and the use of a balance pad is introduced with double leg ball catching.
- This is gradually developed with the athlete demonstrating that they can comfortably perform the exercises using the equipment.
- Eventually the patient progresses to level 8 where they undertake a dynamic circuit, e.g. using a series of bosus medicine balls placed in a row, bouncing on to a balance beam and then hopping over hurdles.
- Another area involved in restoring function is movement and fitness.
- This area probably more than any other is sport-specific and where the physiotherapist knowledge of the sport is essential.
- This area changes greatly depending on injury type and sport involved, however, once again the physiotherapist is encouraged to follow a progressive process, similar to that outlined in Table 14.7.
- A progressive process for movement could begin with some jogging or simple warm up procedures, then it could be developed by introducing some straight line running,

followed by some multidirectional work.

- After this some reaction work may be appropriate for a sprinter for example.
- This can be further progressed by adding in some work with an unpredictability element, for sports such as squash or rugby, so the athlete can learn how to react to specific stimuli.

Table 14.9 The progressive system of stages for balance training

	Mid Rehabilitation Phase			Transition Zone	Late Rehabilitation Phase			
	Level 1	*Level 2*	*Level 3*	*Level 4*	*Level 5*	*Level 6*	*Level 7*	*Level 8*
Hard surface	Introduce work							
Trampoline	Introduce work	Increase work						
Balance pad		Introduce work	Increase work					
Balance disc			Introduce work	Increase Work				
Bosu hard side up				Introduce work	Increase Work			
Bosu soft side up					Introduce work	Increase Work		
Bosu in a row					Introduce work	Increase work		
Complex beam work						Introduce work	Increase work	Increase work
Complex dynamic							Introduce work	Introduce work

Late rehabilitation phase

Joint homeostasis and range; joint movement, muscle length

- At this stage these need only be assessed and maintained and action will only be required if a problem occurs.

Strength

- This is often the main priority at this stage, but there is much more to the rehabilitation of an athlete than improving their strength.
- As outlined in Table 14.7 levels 5 to 7 constitute the late phase.
- Level 5 involves the patient exercising with a load and a balance challenge.
- Level 6 is run at the same demand level as level 5 with gradually increasing load. Level 7 includes the use of load, balance challenge and an extra demand.
- The extra demand in level 7 is where the element of fun can be included in the process.
- The physiotherapist needs to use their imagination and knowledge of the patient's sport.
- The extra demand could be the introduction of a movement in addition to an exercise,

e.g. the patient carries out a set of exercises and then is required to turn and catch a ball, or to run a set distance.

- Up to this point the exercises may have been sets and repetitions (reps) based, this can be built towards using circuits.
- These are more stimulating and fun for the patient as they tend to be more dynamic, including running, skipping or hoping between stations.
- By manipulating the work to rest ratio the exercises can be made more sports specific.
- Another very useful progressive series of work can be lower limb band work.
- This involves the patient undertaking a programme of work that uses a resistance band to make movements such as stepping up more difficult or uses a band around the knees while walking to increase gluteal strength.

Restoring balance and restoring function

- The balance sequence covered in Table 14.9 progresses the patient from static exercises on different surfaces to more dynamic activities.
- Initially the patient balances on a bosu, with the soft side up.
- The progression involves a line of bosus and a balance beam to increase the demand of the exercise.
- The final progression may involve a combination of all these pieces of equipment and ultimately even more dynamic equipment can be used.

Final rehabilitation considerations

Sport-specific activities

- There are other areas which may need to be worked on to improve the sporting function.
- These depend very much on the patient's specific sport.
- One area that may be used in many sports is jumping, which can be progressed through a carefully devised programme.
- Jumping is a part of the overall rehabilitation that may be neglected.
- By concentrating on ensuring the patient uses correct technique during their rehabilitation future injuries can be decreased.
- Jumping can be commenced with the patient carrying out a double leg jump from the ground to land on a small box.
- By using an upward jump with a small landing height there is decreased pressure taken through the lower limb joints on landing.
- This can be progressed as follows:
    - Using a higher box
    - One-footed take off and a 2-foot landing can be used to develop power
    - Higher boxes can be used and 1 foot landings undertaken
    - If there is no effect on joint homeostasis the athlete can begin to jump down

– Eventually plyometric activity can be included.

Fitness and movement

- Fitness and movement work is very sport specific, and it is in this late stage that movements, distances and rest periods can be fine tuned to be sport specific and even position specific.

e.g. a football player who plays as a forward completes approximately 300 metres of sprinting during a game, whereas a central defender only sprints for around 170 metres and yet the total distance covered by a central midfield player is far greater than that covered by players from any other position.

Joint tolerance

- At some stage it may be necessary to work on the tolerance of a joint.
- If a sport lasts for 80 minutes or longer it is important to know that the previously injured area can cope with being loaded for a prolonged period of stress.
- Joint tolerance is often tested during the very late rehabilitation process.
- Games such as badminton or squash can be used to improve strength, co-ordination and endurance and because they are different to many other sports they help to prevent pattern overload.
- The use of circuits is another way of avoiding pattern overload and they can be fun, used to reintroduce the athlete to competition and to incorporate the athlete back into team activities.

Summary

- The rehabilitation of athletes should incorporate a progressive system.
- There are many advantages to using a progressive system which has been covered in this section (Box 14.1).

Box 14.1 Benefits of using a progressive system for the rehabilitation of athletes

- It allows the athlete to see gradual improvements as the system develops
- This system can be used for all athletic development
- If the injured site homeostasis is disturbed the therapist knows exactly what load was put through the area during the last session
- Each session must be notated accurately because in a world of increasing litigation this progressive system of only moving the athlete on when they can easily cope with the previous stage can help protect the clinician if it ever becomes necessary

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Chapter 14

E-materials

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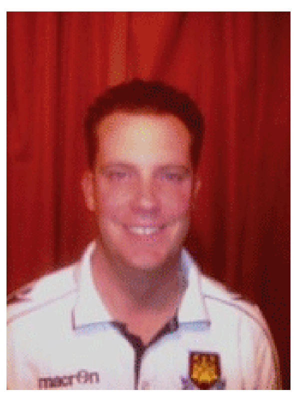
Author profiles

Andrew Rolls MSC BSC(Hons) MCSP

Andy worked in the NHS for a number of years gaining excellent experience in a broad range of practice areas before gradually developing his career in sport with Chelsea FC and in dance rehabilitation working with the English National Ballet. He became a full time sports physiotherapist as the head of medicine at Watford FC and has subsequently taken on the post of Head of Sports Science and Medicine at West Ham United FC.

During Andy's career he has developed a special interest in rehabilitation and how to progress rehabilitation as an objective process, in order to take the guesswork out of rehabilitation.



Captain Mark Jenkins MSc BSc(Hons)

MCSP RAMC

Defence Medical Rehabilitation Centre, Headley Court, Epsom, Surrey.

Mark studied Sport and Exercise Science at Loughborough University before completing his physiotherapy training at Kings College London.

He has been a Physiotherapy Officer in the British Army for 5 years, gaining experience in rehabilitation working with Headley Courts complex trauma teams and multidisciplinary injury assessment clinics, as well as on operational tours in Iraq and Afghanistan.

He is currently Officer in Charge of the Army's Primary Care Rehabilitation Facility in London.

Major Jayne Nixon BSc(Hons) Dip Sport Ex Med MCSP

Jayne is a Lower limb Specialist and Clinical lead at Defence Medical Rehabilitation Centre Headley Court. She has been a physiotherapist for 17 years and has both NHS and Military experience.

Jayne has a diploma in Sports Medicine and is currently completing her MSc. She is a member of the Territorial Army and has been deployed as a physiotherapist both to Iraq and Afghanistan. She has a special interest in Trauma of the lower limb and exercise induced leg pain.

Davina Richardson MSc BSc(Hons) MCSP

Davina is the Clinical Lead Therapist for Neurosciences at Imperial College Healthcare NHS Trust. Davina has worked extensively in the field of rehabilitation in Neurology, Elderly Care and the Community both abroad and in the UK. Davina has been involved in setting up Multi-disciplinary teaching programs in Rehabilitation and has presented material on the International Classification at several International conferences.

Case Study 14.1 Neurorehabilitation

Background

- 55-year-old female with a presentation of neurofibromatosis.
- Worked as a film editor full time, drove to work. Lives with her husband and family in a town house with stairs.
- She enjoys cycling and walking.
- Prior to onset two years ago she had suffered no major symptoms from the condition.
- Two years ago she underwent a cervical laminectomy C5/6 to relieve S&S of spinal cord

compression.

- Six months after this she underwent further surgery in the lumbar spine at levels L1/2 and L3/4.
- She was referred for rehabilitation following surgery as an inpatient (2 weeks), then transferred to outpatient community services (8 weeks).

Assessment findings

- Reduced sensation in both hands and feet.
- Reduced strength in both upper and lower limbs.
- Reduced range of movement in the neck and lower back.
- Altered balance responses.
- Unstable bladder with urgency and frequency of micturition.
- Poor posture.

ADL, restrictions identified at assessment

- Difficulty with dressing, washing, feeding and writing.
- Difficulty walking, frequent falls and needing assistance of two sticks.
- Unable to return to work.
- Unable to cycle.

Treatment aims

- Improve and maintain existing muscle length and strength in the arms and legs whilst working on improving balance reactions and function.
- Prior to working on the cervical and lumbar spine range of movement the physiotherapist checked with the neurosurgeon regarding any limitations or restrictions. None were identified, so treatment also targeted gentle progression of range of movement in the neck and back.

Upper limbs and balance

- Throwing and catching balls initially in sitting with the ball thrown from a short distance to standing and throwing from further away. Gradually increasing the difficulty of the task, once previous task was mastered. Combined work on muscle strength and co-ordination with automatic balance worked well. The size and shape of the ball was used to increase or decrease the difficulty. Progressed to standing.
- Fine hand work targeted function. Peg boards, handwriting, paper folding, griping objects provided stimulus for the hand function. Some compensatory strategies were involved to

allow for success, e.g. adaptation of the pen, knife and fork grips. Improvements occurred as a result of practice and the adaptations were reassessed.

- Postural advice and education was provided at every treatment session together with some general advice on shoulder girdle movements including elevation and depression and elevation through flexion and abduction.

Short-term goals for upper limb functioning

- To be able to use a knife and fork effectively in 4 weeks.
- To be able to do up buttons in 2 weeks.

Long-term goals for the treatment as a whole

- To be able to wash and dress independently in 8 weeks.
- To be able to use a keyboard effectively to participate in some form of work activity in 8 weeks.

Lower limb work and general reconditioning

- All muscle groups were active, but weak.
- Strengthening using sit to stand, increasing the repetitions and changing the speed from fast to slow and slow to fast. Using hands and arms to assist initially, progressing to no assistance.
- Getting on and off the floor to reduce the anxiety and fear of falling.
- Walking practice to increase distance, speed and exercise tolerance.
- Timed 10-metre walking, initially with 2 sticks progressing to 1 stick.
- Stretches taught for all muscle groups.
- Home exercise programme taught and checked, with progression daily/weekly.

Short-term goals for lower limb and balance

- To be able to sit to stand for 2 minutes with arms folded in 1 week.
- To be able to come up and down on tip toes without holding on to support in 2 weeks.

Long-term goals

- To reduce frequency of falls to zero in 1 month.
- To return to work, part time, in 2 months.

Case Study 14.2 Complex trauma

Background

- 22-year-old, right-handed sniper who has served 3½ years in the Army.
- Lives alone in base accommodation.
- The following injuries were caused by an improvised explosive device (IED) whilst on duty in a combat situation 1 year ago:
  - Traumatic right through knee amputation
  - Partial right hand amputation, 3rd to 5th fingers
  - L1 stable transverse process fracture.
- He underwent multiple operations for debridement of wounds.
- His right wrist was fused and the ulna head was excised.
- EDC was repaired in the right hand and the wound was covered and reconstructed with a left serratus anterior free flap.
- He had full memory of the incident, but was experiencing little in the way of flashbacks or nightmares.
- He was reviewed by cardiology for a sinus tachycardia.

Rehabilitation

- Following the acute hospital management he was transferred to rehabilitation.
- He was experiencing low mood and anger issues at this point as his right wrist wound had deteriorated and metalwork had begun to protrude.
- An X-ray suggested osteomyelitis in the distal radius and consequently the metalwork was removed and bone grafts inserted, prior to him beginning his rehabilitation programme.

On assessment

- His observations were stable and there were no chest or heart problems.
- All wounds were closed.
- He was on the following pain relief medication: MST 20 mg OD and Pregabalin 300 mg BD.

Identified problems

- Prosthetics fitting.
- Soreness of the stump, pressure pain from the socket fit.
- Gait disturbance – slight Trendelenburg in walking.
- Poor gait on steep slopes and stairs.
- Decreased hip strength – glut med 4/5, glut max 4/5.
- Decreased quads strength 3/5.
- Poor balance and proprioception.
- CV fitness.
- Core control problems.
- Poor hand function.
- Poor grip and writing – 9 Hole Peg Test on admission; right – 50.3 seconds left – 21.6.
- E-Link Grip Strengths; on admission – 75.5%.
- Problems finding his COG in swimming.
- Mood, sleep and anger issues.
- Long-term occupational issues.

Identified goals

- His main goals were:
  - To improve his balance and gait and progress to running
  - Be able to write his name and address with his other hand in one month.

Treatment aims

- Improve prosthetic fit to enable efficient walking and running.
- Increase hand stereognosis and ROM of the remaining part of the hand.
- Improve swimming pattern, to achieve balance in water.

Week 1

- Daily treatment.
- General progressive strengthening exercises for hip stabilising muscle groups and quads.
- Core stability exercises on Swiss ball and BOSU ball.
- Walking re-education, starting with PPAM aid, progressing to socket.
- Active assisted stretching exercise for the hand and passive mobs for the remaining joints to improve flexion.
- Active exercises for the dexterity of the hand including functional tasks and writing with the OT.
- Balance and proprioception in sitting and standing using Swiss ball and wobble board (sitting).
- Aquatic therapy to gain balance in water and buoyancy resisted work for hip and core.

- Soft tissue treatment on the stump, using silicone on scarring.
- CV work for 20 minutes on hand bike or in the pool.
- Advice on pain management.
- Sleep advice.
- Anger management with CPN.

Week 2

- Daily treatment.
- Increased resistance strength exercises using resistance bands and weights.
- Core control work with less points of contact on the floor and more movement patterns.
- Walking re-education on new socket and on crutches with one arm in a modified crutch out of the parallel bars.
- Gait re-education with a mirror to overcome Trendelenburg.
- Weight transference exercises.
- Metacentric water exercises in pool.
- Taught to do own soft tissue exercises.
- Myofascial treatment on upper limb and stump.
- Balance exercises in standing, e.g. throwing and catching in sitting on the ball and in standing.
- Active stretching and serial splinting of the hands to ensure joint position is improved and maintained.
- Functional strength exercises for the hand and forearm.
- Continued sessions with CPN.
- Referred to OT for occupational issues and planning.
- Engaging in talking about sports and adventure opportunities.

Week 3

- Daily treatment.
- As week 2 for strength plus additional positions and resistance.
- Progressing to walking with one stick out of the bars and increasing distance to 300 m.
- Increasing aquatic work including swimming strokes.
- Fine motor control work for the hand.
- Education on nutrition, health and pain management.
- Taught and practised use of knife and fork and pen by OT.
- Taught and practised stairs and slopes.
- Taught how to hold a golf club and swing.

Outcomes

- The patient was very compliant in physiotherapy and attended all sessions.
- He worked hard to improve his balance and control his hip muscles on the right.
- He managed steep slopes and stairs with ease.
- He was still slightly unsteady when walking heel to toe forwards and backwards, but continued to improving.
- The Trendelenburg gait was corrected, which improved his gait with one stick.
- He occasionally complained of pain, but his understanding of phantom pain enabled him to cope with this.
- He found that he enjoyed golf and despite initially finding gripping with his right hand difficult he adapted well and his game improved.
- He reported enjoying this and wanted to continue playing in his own time.

Future

- The plan for the next months was to continue with balance training and trunk control when weight transferring, to enable him to progress gait training to running.
- Details:
  - Complete kitchen assessment with OT, looking at what functions he needs to gain for his hand movements
  - Complete upper limb standardised assessments and recommence e-link programme
  - Complete onward referral CPN
  - Running re-education and fitting for the running prosthetic
  - Plan for gradual return to work with the aid of the OTs and social workers
  - Continue with education and encouragement with sports and referral to adaptive sport
  - Encouragement to go to a local gym to work on the exercise programme.

Case Study 14.3 Sports injury

Background

- This case study outlines the first three months in the management of a 19-year-old student who sustained an anterior cruciate ligament (ACL) rupture.
- He played semi-professional rugby and had aspirations to becoming a full-time professional player.
- The ACL was ruptured in a rugby match and was reconstructed using a patella tendon graft.
- He then attended for physiotherapy in a sports clinic 6 weeks post operation with little or no prior rehabilitation input from any professional source.

Initial assessment findings

- The knee was very swollen.
- He has lost 10° of knee extension actively and had no hyperextension either actively or passively.
- He had 70° active flexion.
- He experienced some pain on knee movements.
- All ligament tests were good and the ACL graft seemed tight and strong and all meniscal tests were negative.
- He was very nervous and concerned.

Evaluation using the traffic light assessment tool

- Using the traffic light process outlined in the rehabilitation assessment chapter it was evident that the situation was reds and therefore required urgent action (Table CS14.1).
- This prompted the plan to stop the patient doing any activities in order that the leg was allowed to rest appropriately.
- A night splint was provided to protect the knee and to assist in getting full knee extension.
- A discussion was held with his surgeon, so he was aware of the situation and to pre-empt an appointment if it did not improve in the required timeframe.

Table CS14.1 Traffic light assessment at 6 weeks postoperation

Subjective assessment	Objective assessment	Traffic light colour	Action taken
All good	All good	Green	Continue to plan
Some pain or discomfort	Slight increase in swelling and heat and/or decreased ROM	Amber	Change something
Increase in Pain and swelling Patient knows something is not right	Large increase in swelling Joint is hot Decreased ROM Gait poor	Red	Drastic change to plan needed

Initial rehabilitation

- The knee was very swollen and the patient was very concerned about the state of his knee.
- Therefore the priority for the first few sessions was to explain the rehabilitation process to him in order to instil some confidence.
- He was reassured when told that if he followed the guidelines the knee would improve.
- For 6 weeks, i.e. up to 3 months postoperation, the sessions included gentle mobilisation techniques to regain range of motion especially for knee extension (Table CS14.2).
- Of equal importance was what the patient did when not attending the clinic.
- Strict rules were set as follows:
  - He was permitted to walk to college, elevating the leg as often as possible when there
  - No other walking was allowed expect in his house
  - Ice was to be applied 10 minutes on 10 minutes off 10 minutes on, 5 times per day
  - Active exercises were given for him to do 3 times daily
  - Driving was limited
  - An extension splint was to be used for the first 2 weeks, with one hour on and one hour off, in conjunction with a night brace
  - Compression bandages were to be used regularly
  - He was given some very simple balance exercises, but avoided specific strengthening work.
- The progress was monitored using daily assessment tools.
- At his 3 months surgical check up he had minimal fluid around the knee, usually as a result of being on his feet too much.
- He had full knee extension with hyperextension and he had reached 100° of flexion, which was gradually improving.
- The surgeon advised pushing on gradually with the proposed rehabilitation.
- As joint homeostasis was more settled the early assessment table was used to plan the management at this stage (Table CS14.3).
- Subsequently the goals were identified as:
  - Maintaining joint homeostasis and reducing pain (only present towards the end of the day at this stage)
  - Improving balance, including improving his gait pattern
  - Maintaining knee extension and increasing flexion
  - Start to work on specific strength of the lower limb.
- Once joint homeostasis was achieved the range and strength become much easier to improve through intervention.
- The patient progressed quickly and returned to training for rugby after 8 months, initially in a non-contact capacity.

Table CS14.2 Initial goal-led treatment plan

	Criteria	Goal	Assessment	Findings of assessment	Treatment
1	Knee joint homeostasis	No swelling	1. Swelling tests 2. Joint circumference measurements	Homeostasis poor Swelling Joint size much larger than other knee	Advice on PRICE
2	Knee extension	Hyperextension to match other knee	Goniometry to measure range	Lacking 10° active and lacking all hyperextension	Advice on resting positions Physiotherapy mobilisations Soft tissue stretching
3	Knee flexion	Full range of movement	Goniometry to measure range	Lacking flexion	Not worked on yet as there is too much swelling in knee, so just maintained by gentle mobilisations
4	Pain	No pain	VAS at rest, on waking, at end of day and on walking	Too much pain	Contacted surgeon who recommended paracetamol and a course of NSAIDs
5	Mental state	Confident in knee	Conversational assessment	Nervous and concerned	Spent time to explain what we needed to do and how we could slowly improve this situation

Table CS14.3 Use of the early assessment table to plan the appropriate intervention for the patient

	Area of rehabilitation	Assessment tools	Targets	Comments	References
1	Joint homeostasis	Measure joint circumference Swelling tests Heat	Joint homeostasis	See daily assessment tools later in chapter	Magee (1997)
	Pain	Visual Analogue Scale			Magee (1997)
2	Proprioception/Balance	Joint position sense	Equal side to side	UL	Herrington (2005)
3	Joint ROM/Muscle length	Goniometry joint assessment	Equal side to side		
4	Muscle strength	Manual testing Baseline measurements of muscle girth	Grade 2 or 3		

Chapter 14 Rehabilitation multiple choice questions

1. A patient is referred for treatment of a right foot drop. Which of the following is not a cause of the foot drop?
   a). L 5 radiculopathy
   b). Sciatic nerve injury
   c). Femoral neuropathy
   d). Stroke
2. A patient is referred for treatment of a painful shoulder with associated restricted mobility. Which of the following is less likely to cause pain and restricted mobility?
   a). Accessory nerve injury in the neck
   b). Brachial neuritis
   c). Weakness of lower trapezius
   d). Acromioclavicular dislocation.
3. Which of the following is incorrect? A woman with a torticollis to the right side may:
   a). Have increased tone in the right sternocleidomastoid muscle
   b). Respond to injection of botulinum toxin into the left sternocleidomastoid muscle
   c). Have a chance of developing dysphagia, if injected with botulinum toxin
   a. Have associated visual impairment
4. Which investigation might be useful in informing the prognosis of an individual with a metabolic peripheral neuropathy?

a). MRI brain
b). MRI spine
c). Nerve conduction studies
d). Lumbar puncture

5. What assessment should be carried out daily for a patient with GBS who has just been weaned from the ventilator and is slowly improving?
   a). Manual muscle strength testing of the upper limbs
   b). Vital capacity
   c). Sensory level testing
   d). Hospital anxiety and depression score
6. A 40-year-old lady has multiple sclerosis. Severe leg adductor spasms cause uncontrollable bladder voiding. The level of her antispasticity medication is currently being adjusted to attain the appropriate dose. She has difficulty transferring; poor sitting balance and peroneal hygiene issues. What would you consider would be best practice for the management of her bladder at this time?
   a). Antimuscarinic medication
   b). Clean intermittent self catheterisation
   c). Urodynamics
   d). Indwelling catheter
7. Using daily assessment tools, if the situation is deemed red you should:
   a). Continue as planned
   b). Change something minor
   c). Do nothing
   d). Take immediate action that may involve the doctor
8. After a musculoskeletal Injury the first priority is to work on:
   a). Achieving injured area homeostasis
   b). Increasing strength of injured area
   c). Stretching tissues around injured area
   d). Keeping the athlete fit
9. Ice should be applied for:
   a). 30 minutes in one go
   b). 10 minutes on, 10 minutes off and then 10 minutes on again
   c). Any duration as long as the area is cooled
   d). 5 minutes on every hour
10. When introducing a 'Balance Challenge' to an exercise:
    a). The load should initially be removed
    b). The load should be increased
    c). The load should be maintained
    d). The load should be decreased
11. The acronym 'PRICE' used in the initial stages of injury management stands for:
    a). Protection, rest, ice, compression, exercise
    b). Protection, rest, ice, compression, elevation

c). Protection, restriction, ice, compression, elevation
d). Passive movements, rest, ice, constrict, elevation

12. When progressing exercises:
a). The load should be added before a balance challenge is introduced
b). A balance challenge should be the first stage
c). It is important to increase the load as quickly as possible
d). When introducing an exercise always add load after the balance challenge has been introduced

13. When assessing the complex trauma patient which statement is true?
a). Work independent of other clinicians
b). Take a holistic approach using available resources and the MDT
c). Formulate any plans away from relatives and the patient
d). Only consider the physical aspects of rehabilitation

14. Complex trauma consists of which one of the following?
a). Multiple fractures and psychological injury only
b). Neural and soft tissue injury with some fractures only
c). Emotional and psychological injuries with amputations only
d). Any combination of physical, emotional and psychological injury

15. When assessing multiple fractures which of the following is *not* true?
a). You would always check weight-bearing status
b). All patients will experience non-union
c). Peripheral nerve and soft tissue injury may accompany fractures
d). Understanding patient's goals and a good subjective history is essential

16. When setting goals in complex trauma, which of the following statements is true?
a). Do not raise expectations, as recovery will be limited
b). Let the patient's family decide what will be an achievable goal
c). Assess each patient on a case-by-case basis aiming for the highest possible function
d). Only plan day by day

17. Which of the following is *not* a complication of transfemoral amputation?
a). Phantom limb pain
b). Heterotopic ossification
c). Brachial plexus injury
d). Infection

18. In hypersensitivity and allodynia associated with nerve injury, which of the following is *not* a treatment?
a). Neural suppressing drugs
b). Desensitisation techniques
c). Acupuncture
d). Deep tissue massage

19. Which of the following is *not* a neuromuscular disorder?
a). Charcot–Marie–Tooth disease
b). Multiple sclerosis

c). Duchenne muscular dystrophy
d). Amyotrophic lateral sclerosis

20. Patients that have undergone a patellar tendon repair for a ruptured ACL are more likely to have:
    a). Greater weakness in the VMO contraction
    b). Take longer to regain full ROM in the knee
    c). Tend to be less painful than other reconstruction methods post operatively
    d). May experience patella tendonitis during the rehabilitation period

Rehabilitation multiple choice answers

1. c)
2. c)
3. b)
4. c)
5. b)
6. d)
7. d)
8. a)
9. b)
10. a)
11. b)
12. a)
13. b)
14. d)
15. b)
16. c)
17. c)
18. d)
19. b)
20. d)

Chapter 15

Rheumatology

Introduction

- Inflammatory arthritis includes rheumatoid arthritis, systemic lupus erythematosus, scleroderma, polymyositis, vasculitis, spondyloarthropathies and gout, with rheumatoid arthritis being the most common form of inflammatory arthritis. Inflammation may be seen in osteoarthritis, but this is due to a degenerative rather than an auto immune process.
- Rheumatoid arthritis is a chronic unpredictable inflammatory disease of multifactorial origin; it is marked by a variable course, involving exacerbations and remissions of disease activity and often leads to joint damage and functional impairments.
- People often experience pain, joint stiffness, joint swelling, reduced muscle power, loss of joint range of motion, fatigue and extra-articular complications, which can lead to a significant loss of function and independence.
- Management should be patient-centred while taking into account each patient's individual needs; therefore a thorough patient assessment must be completed before any treatment is undertaken.
- The multidisciplinary team (MDT) has been shown to be effective in optimising the management of patients with rheumatoid arthritis (SIGN 2000, Luqmani et al 2006) and patients should have access to all members of the team as necessary. There should be good communication and co-operation between all team members, as it may be necessary to refer onto another member of the team if the problems the patient is experiencing fall outside the scope of physiotherapy practice.

Aims of physiotherapy intervention

- Physiotherapy aims to reduce pain and stiffness, stabilise joints, prevent joint deformity, improve exercise tolerance and muscle power, maximise function, independence and quality of life and promote self management, by utilising a number of various treatment modalities available; education and exercise are the important active aspects of physiotherapy intervention (RCP 2009). Contraindications for each modality should always be considered.

Patient education and self management

- As with any long-term chronic condition, it is essential that patients undertake self management; patient education is therefore an important aspect in the management of rheumatoid arthritis, thus empowering patients to manage their own situation.
- Bandura (1977) in the theory relating to self-efficacy stated that: 'the strength of belief in one's own capacity is a good predictor of motivation and behaviour'. Within groups of rheumatoid arthritis patients, studies have shown that stronger self-efficacy correlates with better health status. It has also been found in some studies, that self-efficacy can reduce the number of visits to health care professionals (Cross et al 2006).
- Many rheumatology units will have a formal group patient education programme, these generally run at regular intervals throughout the year and involve various members of the MDT, who each deliver relevant information. Physiotherapists provide information related to exercise, function and self management strategies, e.g. goal setting, which can help to change patients behaviour (Barlow et al 2005). It has been reported this particular mix of education and advice can improve knowledge, self worth and early morning joint stiffness for up to 1 year post intervention (Bell et al 1998, Lineker et al 2001).
- Primary care trusts run the expert patient programmes for people with long-term chronic conditions and are not disease specific. The patients are facilitated to develop their communication skills, manage their emotions, manage daily activities, interact with the healthcare system, find health resources, plan for the future, understand exercising and healthy eating, and manage fatigue, sleep, pain, anger and depression (Department of Health 2006).
- Any patient contact can be used as an opportunity to enhance patient knowledge and understanding of their disease and self management and can be personalised for each patient, so that each individual has their specific needs met.
- Joint inflammation can cause tiredness and a general feeling of being unwell, therefore advice about pacing should always form part of a patient's rehabilitation (Braun and Sieper 2006, Vlak 2004, Liu et al, 2004).
- Patient education has been shown to:
  - Increase patient knowledge about their disease
  - Help patients to make informed choices
  - Encourage self management
  - Empower patients
  - Improve self confidence (Schrieber and Colley 2004).
- Education should be made available in different languages and styles to suit the local population (Luqmani et al 2009).

Patient support groups

- Voluntary organisations such as National Rheumatoid Arthritis Society (NRAS), Arthritis Care and Arthritis Research UK (formally ARC), all provide excellent written information for patients with rheumatoid arthritis.

- Information on the NRAS and ARC sites are written by health professionals and are regularly reviewed to ensure up to date evidenced based and accurate information is provided specifically for UK residents (Luqmani et al 2009). The organisations provide help lines for patients and NRAS are able to put patients in touch with one another. It is seen to be helpful for patients with the disease to talk to others with the same condition.
- NRAS will also provide support for units to set up patient support groups; these are groups run by the patients for the patients and provide a continuous source of information and education, enabling patients to support one another. The format of the meetings tends to vary according to the population that attend the groups (www.nras.org.uk).

Exercise therapy

- Exercise is the foundation of physiotherapy and should be utilised and encouraged in the treatment of patients with rheumatoid arthritis.
- Exercise therapy can be delivered on land or in water and research supports the use of aerobic activity, improving range of movement, muscle strengthening, stability (balance) and promotion of physical activity.
- When treating patients with a diagnosis of rheumatoid arthritis, it is important to remember that studies have shown that this group of patients tend to be more sedentary and are at greater risk of cardiovascular disease, (Luqmani et al 2006, Sokka and Hakkinen 2008) and osteoporotic fractures than the non-rheumatoid arthritis population (Turesson and Matteson 2007).
- Loss of body cell mass has been described in rheumatoid arthritis (Rall & Roubenoff 2004). The reasons for weight loss in rheumatoid arthritis include factors such as mechanical problems leading to muscle wasting, poor appetite and the metabolic drain of the inflammatory response (Munro and Capell 1997).
- Many factors may lead to reduced activity in this population group including: joint pain and stiffness, loss of body cell mass and disuse of muscles leading to loss of strength and possibly a fear of causing damage through over activity.
- Patients with RA therefore may have reduced:
  - Muscle strength
  - Aerobic capacity and endurance (Hakkinen et al 1995)
  - Limited flexibility and poor standing balance (Eurenius and Stenstrom 2005).
- In addition to its general effects of reduced risk of coronary heart disease, hypertension and diabetes, exercise has shown to improve function in rheumatoid arthritis. (De Jong et al 2004, Van den Ende et al 1998). Dynamic exercise, that is: exercise of sufficient intensity, duration and frequency to establish an improvement in aerobic capacity and/or muscle strength, has been shown to be efficient in increasing muscle strength and aerobic capacity in patients with stable disease (RCP 2009).
- For some time, it was thought that dynamic, active exercise would cause increased pain, prolong active disease and lead to joint destruction (Hurley et al 2002*)*. There is

evidence to show the usefulness and safety of dynamic exercise in the rheumatoid arthritis population. Self-management and exercise has been shown to improve physical and psychological wellbeing. Aerobic exercise is known to improve health related fitness, reduce pain and fatigue, and improve function without aggravating or hastening joint destruction. Joint range of motion and specific strengthening exercises are beneficial (RCP 2009). Most of the evidence is obtained from chronic stable rheumatoid arthritis patients. Recorded improvement in muscle strength, aerobic capability, endurance, function, self value and well being have followed participation in dynamic exercise (Hurley et al 2002).

- No adverse effects on the disease activity or pain have yet been observed (SIGN 2000).
- Patients with rheumatoid arthritis have an increased risk of developing both generalised and juxta-articular osteoporosis and associated osteoporotic fractures (Deodhar and Woolf 1996, Lodder et al 2004). Juxta-articular osteoporosis is thought to be due to an increase in local vascularity and direct invasion by the pannus; in addition, the inflammatory mediators are also implicated. Systemic inflammation and reduced mobility due to functional impairment (Deodhar and Woolf 1996) are thought to be factors which can lead to generalised bone loss. Weight-bearing exercise can be beneficial in helping to prevent bone loss and improve balance (De Jong et al 2004). Lemmey et al (2009) were able to demonstrate increased muscle mass, reduced fat mass and restoration of function in their study of supervised progressive resistance training.
- Exercises and exercise advice should be modified for each individual patient and can be adapted to aid functional activities in which the patient may be experiencing a particular difficulty.
- Exercise should be encouraged in patients with rheumatoid arthritis to reduce the risks that the disease can cause as outlined above. Exercise does not exacerbate disease activity or cause joint damage in the short term (Luqmani et al 2006).
- Exercise regimens have been shown to be more successful in patients where personalised contact with a health professional occurs, where the benefits of exercise can be discussed (RCP 2009). Government recommendations for the amount of exercises a healthy adult (16-64 hears old) should undertake is 30 minutes of moderate intensity (cycling or fast walking) on 5 days of the week (www.patient.co.uk).

Exercises to be included in a patient's programme

Range of movement exercises

- Used to maintain or improve range of movement and flexibility of joints and to relieve joint stiffness.

Strengthening exercises

- To improve motor function, by maintaining or improving muscle strength, improve function and aid joint protection.

- This can be achieved by:
  - Using free weights: such as a used plastic bottle (filled with varying amounts of tap water) or dumb bells
  - The patient's own body weight against gravity
  - Thera-Band (resistance band)
  - Resistance machines
  - Exercise in water. In their progressive resistance training study Lemmey et al (2009) used 80% of one repetition, maximum of 3 sets of 8 repetitions. Starting at 1 set in the first week, and 2 sets in week 2, to reduce the risk of muscle soreness. Exercises were performed on a multi-stack machine.All subjects had established, stable RA.

Aerobic, dynamic exercises

- To improve cardiovascular fitness, maintain optimal weight, maintain or improve function, improve psychological fitness and reduce pain and fatigue. It is also known to have a positive effect on function without exacerbating disease activity or causing joint damage in the short term.
- Aerobic exercise can include activities such as:
  - Brisk walking
  - Cycling
  - Swimming
  - Aerobic dance
  - Water aerobics
  - Stair climbing
  - Jogging.
- Aerobic exercise should be carried out at low to medium intensity (SIGN), sufficient to increase the heart-rate to a higher level, allowing the patients to carry on a short conversation whilst exercising. Exercise that fits into the patient's daily routine and something which they enjoy doing will help them to maintain their programme.
- Encourage patients to try something new. Local areas will usually have various exercise programmes for all abilities and interests; look at what is available locally.
- The amount of exercise will vary from patient to patient. Patients should develop and monitor their own progressive exercise programme.
- Patients should understand the importance of exercising so that they do not over- or under-exercise.
- It is important to build up exercise gradually, to prevent the possibility of causing increased joint pain, at the same time; patients should be advised about the increased muscle pain often associated with starting a new exercise. It is important to set appropriate goals with the patient before starting exercise.

Setting a baseline

- Prior to starting any exercise programme, a baseline will need to be determined.
- Establishing a manageable baseline for exercise or activity can be achieved by asking the patient to decide for themselves how much exercise/activity will be suitable for them, e.g. cycling on a static bike for 8 minutes.
- The following day, the patient assesses how they feel following the exercise: Did I overdo it? Was it too easy?
- They will then adjust the exercise/activity, based on their own judgement; it might be more. For example cycling for 12 minutes on a static bike.
- The average time for the two days is then calculated, minus 20%.
- This will ensure that the exercise is manageable on days when the patient does not feel quite so good.
- For this example:

$$8 \text{ mins} + 12 \text{ mins} = 20 \text{ mins}, 20 \text{ mins} \div 2 \text{ days} = 10 \text{ mins},$$
$$10 - 20\% = 8 \text{ minutes as a baseline.}$$

- Exercise can then be increased from this baseline, with the patient avoiding doing too much on a good day with the possible consequence of being unable to do much on the following day.
- The patient can then work towards their goal as per the following example:
  - Week 1: the patient could exercise Mon, Wed, Fri for 8 minutes on the bike,
  - Week 2: Mon and Fri 8 minutes. Wed 10 minutes.
  - Week 3: Mon, Wed, Fri for 10 minutes.
  - Week 4: Mon and Fri for 10 minutes on Wed for 12 minutes (Figure 15.1).
- This ensures consistent and gradual increase in exercise.
- An alternative method is to work out using maximal heart rate.
- The recommended aerobic exercise is 60–85% of maximal heart rate for 30–60 minutes, 3 times a week.
- For patients to determine their baseline aerobic exercise capacity, they will need to subtract their age from 220, this will give them their approximate maximum heart rate, e.g. for a patient aged 55 years, 220 – 55 = 165 beats per min.
- If the patient has been fairly sedentary, it may be appropriate to suggest them working at 55% to 65% of that number during their exercise session, e.g. for a patient aged 55 years old, maximum heart rate is 165 (220 – 55), they would exercise for 20 to 30 minutes with their heart rate between 91 and 107 beats per minute:

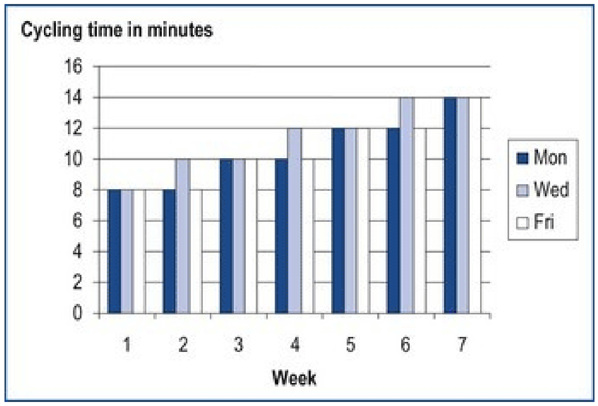


Figure 15.1 Example of exercise baseline.

$$55 \times (165/100) = 91 - 65 \times (165/100) = 107$$

Aquatic Physiotherapy in the treatment of rheumatoid arthritis

- A working knowledge of Aquatic Physiotherapy, including safety issues, contraindications, precautions, how to utilise the properties of water and local guidelines is required before treating patients in a therapy pool (Bruckner & Khan 2005).
- Aquatic physiotherapy is one of the oldest and most frequently used treatment regimes for rheumatoid arthritis.
- In the long term Aquatic Physiotherapy has been shown to reduce hospital admissions and has few if any negative effects (Hurley et al 2002).
- It is essential that patients are assessed for contraindications to Aquatic Physiotherapy, which may prevent some patients with rheumatoid arthritis from accessing the modality.
- Clinically, patients can move more readily in water and are able to perform activities which they cannot perform on land, e.g. walking or muscle strengthening.
- Loading across joints is reduced by buoyancy which allows functional exercises to be undertaken (Harrison and Bulstrode 1987, Harrison et al 1992).

Therapeutic effects of Aquatic Physiotherapy

- These include:
  - Relief of pain

- Maintenance or improvement of movement
- Reduction of muscle spasm
- Strengthening of weak muscles
- Increasing tolerance to exercise
- Re-education of functional activities (Minor et al 1989, Stenstrom et al 1991)
- Enhanced cardiovascular fitness (Chu & Rhodes 2001)
- Progressive weight bearing
- Enhanced wellbeing from enjoyment, social interaction and sense of achievement (Hall et al 1996, RCP 2009).
- Improved balance and proprioception (Hinman et al 2007, SIGN 2000, Luqmani et al 2006, Hurley et al 2002).

Joint protection

Application of core skills

- It is important to remain focussed on the core skills within physiotherapy that can be used to protect joints.
- It may be necessary to refer onto another member of the MDT, e.g. occupational therapy or a specialist hand therapist.

Joint changes

- Normal joints are stable because of the conformity of the bone ends, surrounding capsule and ligaments and the muscles and tendons that move the joint.
- Where there is frequent inflammation of a joint, the surrounding soft tissues become stretched, ligaments are disrupted and invasive pannus erodes cartilage and subchondral bone.
- The results of repeated inflammation are pain, joint stiffness, loss of muscle power, instability as a result of the joint erosion and ultimately deformity.

Process of joint protection

- Patients must be taught how to perform daily activities while placing minimal stress on joints in order to reduce pain, preserve joint structures and conserve physical energy.
- Altering the way, in which people perform certain jobs together with the use of aids and gadgets, can help to maintain independence and protect joints.
- The level of activity can be adjusted according to the level of pain the patient is experiencing. Where possible:

- Advise spreading the load over several joints, e.g. using two hands to carry an object, rather than one.
- Use larger, stronger joints, e.g. the hip or shoulder to shut a door, or forearms to 'hug' objects close to the body.
- Reduce of the effort needed to perform a task by using aids and gadgets e.g. electric tin openers or jar openers.
- Change position at regular intervals avoiding prolonged static postures.
- Avoid positions such as wrist flexion and ulnar deviation at the MCP joints, which may increase the risk of joint deformity (Hammond and Freeman 2001, O'Brien et al 2006, ARC 2007).

- Certain types of grip may present a risk to joints, a tight or prolonged pinch grip or a static grip (as in knitting), places an increased force on the MCP joint and the palm, pulling on the MCP joint, tight or prolonged static grips should be avoided.
- Exercise has an important role in joint protection and should be part of a daily routine, which will help to maintain range of movement, enhance muscle strength and promote general well being.

Fatigue and pacing

Fatigue

- Described as physical and mental weariness and can affect quality of life (Luqmani et al 2009).
- It has been reported that 40–80% of patients with rheumatoid arthritis experience fatigue day after day, irrespective of what they have been doing (Pollard et al 2006, Van Hoogmoed et al 2010).
- Disease activity is thought to be a factor in fatigue allied to other influences such as; pain, psychological and social factors, health beliefs and illness perception, there is also a suggestion that this may be centrally mediated (Pollard et al 2006).

Pacing

- Patients must find a balance between rest and activity by pacing themselves.
- The appropriate amount of rest and relaxation during daily activities can be significantly effective in helping patients to manage the disease.
- Advising patients to recognise their limitations is important, e.g. If an activity 'feels like it's too much', then 'it is too much'.
- Planning which jobs can be eliminated, made simpler, finding the most economical way of performing the activity, using gadgets and aids to assist or enlisting the help of others will all help in conserving energy for the things which are really important to the patient.

- Clinically, it is often difficult for patients to readjust to their disease particularly at the onset, as fatigue is often a problem and will influence the amount of activity undertaken.
- Exercise has been shown to improve physical fatigue as well as psychological wellbeing and self efficacy, encouraging exercise in this patient group allows them to take more responsibility for their own management (Luqmani et al 2009).

Managing a 'flare'

- Rheumatoid arthritis is an unpredictable disease and many patients will experience times when their arthritis worsens, with increased pain and stiffness, this is often referred to as a 'flare' and can last from a few hours to several days. Patients may also experience increased fatigue, appetite loss and low mood during these periods.
- Patients need to be advised about a number of management strategies in order that they can choose what works the best for them.
- During a flare, patients should still move the affected joint(s) within a comfortable range of movement, several times a day, to relieve stiffness and maintain muscle tone.
- Force or resistance should not be applied to the affected part.
- If able, gentle exercise for the rest of the body can be carried out, ensuring that the activity is paced.
- If the wrists are affected, wrist splints may help to rest and support the joint, relieve pain and keep the wrist in a good functional position.
- Relaxation may be of benefit, but it can take practice. Patients can learn how to let go of physical muscle tension and release physical stress.
- Cool packs, for red, hot, swollen joints, or heat for painful joints can be used to relieve joint signs and symptoms.
- Some patients may find transcutaneous electrical nerve stimulation (TENS) useful.
- Establishing a good sleeping pattern may help reduce muscle tension and pain.
- Patient support groups provide excellent advice on coping with flares (Appendix 15.1).

The cervical spine in rheumatoid arthritis

- Cervical spine involvement is often seen in rheumatoid arthritis and other inflammatory diseases such as psoriatic arthritis, ankylosing spondylitis and juvenile idiopathic arthritis.
- Joint, bone and ligament damage can lead to subluxations, which are reported to occur in 43–86% of all patients with rheumatoid arthritis (Roche et al 2002).
- There are indications that subluxations begin soon after the onset of disease.
- A study of patients admitted to hospital for hip or knee surgery showed that 61% had cervical instability and longitudinal follow-up at autopsy indicates that cord compression is the cause of death in approximately 10% of patients with rheumatoid arthritis and

cervical spine involvement (Luqmani et al 2009, Roche et al 2002).

- The severity of cervical spine involvement correlates with the duration and severity of the disease, resulting in varying degrees of instability in the cervical spine.
- Approximately 30% of patients with cervical instability will be asymptomatic and it may be difficult to detect signs of neurological deficit in the presence of a painful arthritis, with associated muscle atrophy or weakness (Luqmani et al 2006).
- Anterior atlantoaxial subluxation is the commonest form of subluxation seen in this patient group, followed by subaxial subluxation of the lower cervical vertebrae.
- Basilar invagination (or vertical subluxation) is the most dangerous form of subluxation and posterior and rotatory atlantoaxial subluxations are rare (Roche et al 2002).

Anatomical considerations

- Rotation of the head is performed at the atlantoaxial C1 atlas and C2 axis, vertebral segments.
- The odontoid peg (dens) acts as an axis of rotation and the odontoid peg is held against C1 by the transverse ligament, which runs from one side of C1 to the other.
- The odontoid peg prevents forward slipping of C1 on C2.
- Alar ligaments pass upwards and outwards to attach to the condyles of the occiput from either side of the odontoid peg.
- Synovial joint effusion, proliferation of synovial tissue together with osteoporosis combine to destroy the odontoid peg as well as the transverse and alar ligaments, resulting in atlantoaxial subluxation with concomitant/coexistent narrowing of the spinal canal.
- When the ligaments are damaged, the head will tend to pull the atlas away from the axis during flexion and cause the subluxation.
- Vertical subluxation (basilar invagination), as a result of destruction of the lateral atlantoaxial joints and atlanto-occipital joints leads to upward migration of the odontoid and surrounding pannus into the foramen magnum, compressing the brainstem and spinal cord.
- In these patients sudden death may occur after unexpected vomiting of physical trauma. Basilar-vertebral insufficiency may also occur in these cases, with syncope after flexion.
- Vertical subluxation and atlantoaxial subluxation may occur together.
- Patients may present with symptoms such as new cervical and/or head pain, C2 neuralgia or cervical spine stiffness.
- Hakkinen et al (2005), found that patients with atlantoaxial disorders had reduced muscle strength in flexion, extension and rotation.
- Treatment of rheumatoid cervical spine involvement is usually conservative.
- For patients who present with severe intractable pain or myelopathy, surgery is usually indicated (Choi et al 2006, Kauppi et al 2005).
- Diagnosis of cervical spine involvement is by plain X-ray, with lateral views of the cervical spine taken in full flexion and full extension (Kauppi and Neva 1998) and through the

mouth views for C1/C2 specifically (Geusens et al, 2005).
- MRI is commonly used to assess the degree of degeneration in the articular cartilage.

Physiotherapy management and treatment of cervical spine problems in rheumatoid arthritis

- Patients with cervical spine involvement may report symptoms which include headaches and pain extending from the cervical spine to the posterior aspect of the head and into the shoulders. It is thought that these symptoms are as a result of muscle spasm and weakness of the muscles of these areas (Kauppi et al 2005, Luqmani et al 2009).
- The limited evidence to support the physiotherapy management of instability in the cervical spine in rheumatoid arthritis indicates changes in patient behaviour, with clinical and statistical reduction in pain (Kauppi and Neva 1998).
- Kauppi et al (1998, 2005) suggest that treatment is multidisciplinary and should include: patient information, disease activity control, symptomatic treatments and physical exercises, e.g. isometric muscle training, posture advice, provision of practical aids and ergonomic advice.

Muscle re-education

- Specifically treatment should aim to reduce muscular tension in the occipital triangle, and increase strength and endurance of this group of muscles and their antagonists, the deep flexors.
- Isometric or slightly dynamic, flexion, extension and rotation exercises can be taught, against yielding resistance (a finger).
- The introduction of proprioceptive neuromuscular facilitation techniques (PNF) such as contract relax can be used to improve the functional control of these muscle groups.
- Larger muscles of the cervical spine and shoulders should be exercised to ensure control and power is developed throughout their functional range.
- Dynamic flexion and full rotation of the spine were avoided.

Collars

- Cervical collars can be provided to relieve symptoms of neck pain (Kauppi and Anttila 1996).
- It is thought that these warm the cervical muscles and reduce painful tension and have psychological significance for patients.
- Collars made of closed-cell foam polyethylene, strengthened to prevent forward flexion, can be given to provide support for patients with atlantoaxial instability (Kauppi and

Anttila 1996, Kauppi et al 1999).

- These patients must be advised to avoid flexion during daily activities, a collar can remind the patient to avoid this movement. They can be weaned off the collar as they get used to avoiding flexion (Luqmani et al 2009).
- Collars should not be used continuously and not when it would increase the risk of falling.
- A collar can provide support when in a car as a passenger, as even a minor injury or accident may have serious consequences for a patient with upper cervical instability. Muscular strength must be maintained and range of movement exercises should be performed, as discussed above (Kauppi and Anttila 1996).
- Specific written instructions should be provided and the patient is also required to inform the DVLA if intending to continue driving.

Other modalities

- Electrotherapy, e.g. TENS, can provide symptomatic relief.
- Heat, hydrotherapy and relaxation may also be useful in the reduction of unwanted muscle tension and the relief of pain (Kauppi et al 1998).

The shoulder in rheumatoid arthritis

- Painful shoulders are often reported in patients with rheumatoid arthritis.
- Problems which occur commonly include: impingement, acromioclavicular arthritis, degeneration/erosion of the glenohumeral joint, rotator cuff tears, deficient rotator cuff, and long head of biceps involvement.
- Exercise has been shown to be effective in the management of rotator cuff disease including longer term functional benefits.
- Maitland's mobilisation and exercise used in conjunction have been found to be beneficial for rotator cuff lesions.
- Ultrasound is often used clinically; however, there is little evidence to indicate that this influences shoulder pain, adhesive capsulitis or rotator cuff involvement.
- There is some suggestion that corticosteroid injections are beneficial in rotator cuff lesions and adhesive capsulitis, therefore the physiotherapist should ensure that they liaise with a rheumatologist if this may be indicated (Buchbinder et al 2003).

The elbow in rheumatoid arthritis

- Elbow involvement may result in loss of extension early in the disease, supination may also be a problem.
- Patients may adduct the elbow across the abdomen in order to rotate the ulnar and obtain

supination.

- Epicondylitis and olecranon bursitis may be present.
- Loss of flexion may occur late in the disease and upper limb function may be severely limited. (Isenberg et al 2004).

The hand in rheumatoid arthritis

- The hands are affected in up to 90% of patients with rheumatoid arthritis.
- Patients who undertake hand strengthening and hand mobilising exercises improve their upper limb function (Luqmani et al 2006, 2009, SIGN 2000, O'Brian et al 2006).

The knee in rheumatoid arthritis

- Inflammation of the knee often leads to quadriceps atrophy and flexion contracture, which require treatment, e.g. with ice and exercises.
- A popliteal cyst (Baker's cyst) may produce swelling posteriorly in the popliteal fossa, this may rupture causing swelling and pain in the calf and may be mistaken for a DVT.
- Longstanding knee involvement may result in valgus instability, flexion contracture and reduced mobility (Isenburg et al 2004).

Foot care

- Foot involvement in rheumatoid arthritis has been shown to occur in 50–89% of patients (Michelson et al 1994, Kerry et al 1994).
- The prevalence of foot and ankle symptoms has been shown to be related to the duration of systemic illness, i.e. patients with longstanding rheumatoid arthritis have a high prevalence of foot and ankle symptoms (Michelson et al 1994).
- It is important to remain focussed on the core skills within physiotherapy relating to foot care. It may be necessary to refer onto another member of the MDT such as orthotics/podiatry services.
- Involvement of the small joints in the feet often occurs early in rheumatoid arthritis and for many patients, even mild involvement of the feet can cause a significant reduction in mobility and function (Keenan et al 1991, RCP 2009).
- In conjunction with the general impact of the disease, changes in the feet such as hallux valgus, hallux rigidus and valgus heel cause progressive functional impairment that can prevent patients from participating in work, leisure and normal daily living activities.
- Toe deformities including: claw, mallet, hammer toes and flexion of both IP joints with planter subluxation of the MTP joints may occur; toes may also cross over one another.
- Symmetric involvement of the metatarsal-phalangeal (MTP) joints may result in

tenderness to palpation and can lead to widening of forefoot.

- Subluxation of MTP joints with anterior displacement of plantar fat pad can lead to patients reporting of painful feet on weight bearing, and is often described as 'like walking on pebbles' This can lead to tender calluses and in a small number of patients, ulceration.
- Other changes to the feet may include subcutaneous nodules, which tend to form over bony areas, tenosynovitis of long flexor and extensor tendons and bursitis.
- Foot care advice is important and appropriate referral to podiatry services for the management of foot problems is important.
- Foot exercises can be provided that may improve balance and proprioception.
- Foot orthoses and specialist foot wear are an effective intervention (RCP 2009).
- Gait re-education may be useful once a patient has been provided with supportive footwear.

Thermotherapy in rheumatoid arthritis

- Superficial heat and cryotherapy (ice/cold) are commonly used in patients with rheumatoid arthritis to relieve pain, stiffness, muscle spasm and swelling.
- Both can be applied by the patient safely in their own home, with no harmful effects. There is no evidence to show that heat or cryotherapy have any undesirable effects on disease progression or joint destruction (Luqmani et al 2006).
- Heat appears to be effective in relieving stiffness (Luqmani et al 2006, Hurley et al 2002, Robinson et al 2002, RCP 2009).
- The skin should be protected from dry heat sources such as hot water bottles, wheat bags, electric heat pads, or jelly pads.
- Showers or baths, a basin or bowl of hot water or a damp towel heated in the microwave provide a moist heat source (RCP 2009).
- Cold appears to be beneficial for pain relief, with cold rather than heat being useful for active joints (Luqmani et al 2006, Robinson et al 2002, RCP 2009).
- Sources of cold therapy include using a bowl of cold water (ice cubes can be added), for hands or feet, a bag of frozen peas, mouldable ice pack (wrapped in a damp tea towel) or a damp towel kept in the fridge.
- Paraffin wax baths combined with exercises have shown to provide short-term effects for hands (Luqmani et al 2006).
- Thermotherapy tends to be used as an adjunct to other treatments and as a palliative therapy to help manage the symptoms of rheumatoid arthritis (Luqmani et al 2006, Robinson et al 2002, RCP 2009).

Use of aids, gadgets, assistive devices,

splints and walking aids

- It is important to remain focused on the core skills within physiotherapy relating to this area of patient management. It may be necessary to refer onto another member of the MDT such as occupational therapy or specialist hand therapist.
- Using aids/gadgets/assistive devices can help to improve function with activities of daily living (ADL), e.g. jar openers, electric can openers (Luqmani et al 2009).
- Splinting may be useful to provide pain relief e.g. resting hand splints and working wrist splints have been shown to reduce pain on activity (SIGN, 2000).
- Walking aids can reduce load on affected lower limb joints, decreasing pain and compensating for impairments in ROM, muscle strength, joint stability, coordination and endurance (Van de Esch et al 2003).
- Unfortunately, in some cases, walking aids may increase pain in the upper limbs, therefore specially shaped walking devices are available, such as gutter crutches/frames and Fisher shaped hand holds for sticks.
- Disability, pain, and age-related impairments determine the need for walking aids and non use is often associated with less need for a walking aid, or the patient being reluctant to use a visible support (Hurley et al 2002, Van de Esch et al 2003).

Tai Chi

- Tai Chi is an ancient Chinese health promoting martial art form and has been recognised in China as a therapy for arthritis for centuries.
- Studies into Tai Chi appear to show an improvement in lower limb joint range of motion in patients with rheumatoid arthritis, without aggravating symptoms.
- It is not considered helpful for improving function, grip strength, or in reducing the number of swollen or tender joints.
- Generally, patients enjoy doing it and it promotes a feeling of well being (Han et al 2004).

Passive treatments

- Passive treatments such as electrotherapy or manual therapy techniques, can be used for specific clinical impairments to facilitate the ability of the patient to exercise or increase physical ability (RCP 2009).

Electrotherapy

- Often used to relieve pain and improve function (Brousseau et al 2002).
- Symptoms of pain, discomfort and stiffness in rheumatoid arthritis are controlled by

pharmacological intervention, therefore other forms of symptom relief are used as an adjunct to the provision of medication when the patient may be suffering side effects from pain relieving medication.

- There is poor evidence supporting the use of electrotherapy with rheumatoid arthritis, with TENS being viewed as being of short-term benefit for the relief of symptoms (RCP 2009).

TENS

- TENS is used for the control of pain; however the use of this treatment modality is mainly based on clinical experience rather than evidence from clinical trials.
- The benefit of TENS is that it has few side effects and can be applied by patients themselves, in their own homes as they need it (Brousseau et al 2003).
- There are conflicting views on the effectiveness of TENS on pain outcomes in patients with rheumatoid arthritis (Brousseau et al 2003).
- There is evidence that acupuncture-like TENS has shown a statistical and clinical benefit on pain and a clinical benefit on the improvement of muscle power scores over placebo, whereas conventional TENS did not appear to show any clinical benefit for pain intensity over placebo (Brousseau et al 2003, Luqmani et al 2006).

Ultrasound

- Ultrasound (u/s) is infrequently used in the treatment of rheumatoid arthritis and there are few studies which provide scientific evidence for its use within this patient group. Minor changes in grip strength, improvement in the number of painful and swollen joints and dorsal flexion of the wrist have been found following the application of u/s.
- Long-term benefits are unknown and no harmful effects have been reported.
- However, it should be remembered that self-management and empowerment is one of the management techniques in rheumatoid arthritis and in light of the poor supporting evidence for the use of u/s this makes ultrasound an unlikely choice as a treatment modality.

Low level laser therapy (LLLT)

- The effectiveness is uncertain and there appears to be little if any analgesic effect (Brousseau et al 2005, Hurley et al 2002, Heussler et al 1993).
- There is insufficient evidence to draw any conclusions about the effectiveness of laser (Brousseau et al 2005).

Electrical stimulation

- There is no evidence to justify the use of electrical stimulation with rheumatoid arthritis patients to improve muscle strength and resistance to fatigue (Pelland et al 2002).

Acupuncture

- Conflicting evidence exists for the use of acupuncture in the treatment of rheumatoid arthritis.
- Studies to date do not appear to show an improved effect on ESR, C-RP, pain, number of swollen or tender joints, or patient global assessment of pain.
- However, some clinicians use it with their patients, reporting some benefit, with no detrimental effects being reported (Casimiro et al 2005).

Manual therapy

- 'Hands on' techniques include joint and soft tissue mobilisation and manipulation.
- It is important to consider the contraindications to manual therapy such as osteoporosis or the presence of inflammatory arthropathy in the spine (Maitland 2005).
- The effect of manual therapy remains uncertain due to the scarcity of research in this area (RCP 2009).

Spondyloarthropathies

- These are inflammatory conditions affecting the spine and enthesis (attachment of tendons and ligaments into bone), which overlap and are distinct from rheumatoid arthritis.
- Patients are seronegative for anti-immunoglobulins and present at any age with young adults being primarily affected, with a slight male predominance.
- The different seronegative spondyloarthropathies have distinct clinical features (Boxes 15.1 and 15.2).

Box 15.1 Seronegative spondyloarthropathies

- Juvenile ankylosing spondylitis
- Psoriatic arthropathy
- Reactive arthritis
- Reiter's syndrome
- Enteropathic arthritis (ulcerative colitis, Crohn's disease)
- Ankylosing spondylitis

Box 15.2 Clinical features of spondyloarthropathies

- Sacroiliitis
- Spondylitis

- Peripheral arthritis
- Enthesopathy – achilles tendinitis or plantar fasciitis
- Systemic features include:
- Psoriasis
- Inflammatory bowel disease
- Iritis
- Genitourinary inflammation

Psoriatic arthritis

- There is an association between psoriasis and inflammatory arthropathy.
- Peripheral joints as well as the axial skeletal and sacroiliac (SI) joints can be affected.
- Psoriatic arthritis can present in a number of ways:
  - Symmetrical polyarthritis (rheumatoid like)
  - Spondyloarthropathy (resembling AS)
  - Asymmetric oligoarthritis (inflammation in 2–4 joints)
  - Distal interphalangeal joints
  - Arthritis mutilans (severe form of arthritis)

Reactive arthritis and Reiter's syndrome

- Typically have large joint involvement and may result from an immune reaction to infection elsewhere in the body.
- There may be a history of genital or gut infection, the commonest genitourinary trigger being *Chlamydia*.

Enteropathic arthritis

- This may accompany ulcerative colitis or Crohn's disease.
- Patients may develop ankylosing spondylitis or an acute peripheral arthritis.
- SI joint involvement may be asymmetric.

Ankylosing spondylitis (AS)

- A chronic inflammatory disease, which mainly affects the axial skeleton.
- Inflammation occurs in the synovial tissue, spinal ligaments, facet joints, and intervertebral discs.
- AS can be primary (Idiopathic) or secondary (associated with psoriasis or inflammatory bowel disease).

- Clinically, patients suffer from pain and stiffness of the spine and sacroiliac joints. Peripheral joints can also be involved and enthesitis can also be a feature (Khan 2002, Sieper et al 2002).
- Osteoporosis is common in AS, with a reported incidence of 18–62% and males being greater than females (Bessant and Keat, 2002).
- It is usually seen in the axial skeletal, often in patients with syndesmophytes, cervical fusion and peripheral joint involvement.
- The risk of vertebral compression fracture in an AS patient, occurring in a 30 year period following diagnosis is 14% and may follow a relatively minor trauma (Bessant and Keat 2002).
- In early AS, inflammatory mediators are implicated in causing osteoporosis whereas in late AS, decreased mobility may result in osteoporosis.
- Evidence is available to show that patients with AS who smoke, have poorer functional outcomes (Averns et al 1996). The costovertebral joints are affected, which leads to a reduction in mobility of the thoracic cage, AS can therefore reduce the capacity of the lungs, smoking can add to this and could make patients more prone to shortness of breath and lung infections.
- Exercise is important in the management of this aspect of AS.

Physiotherapy management of AS

- Physiotherapy is central to the management of AS and newly diagnosed patients should be seen as soon as possible after diagnosis.
- Due to the chronic status of the disease, physiotherapy management should include education about the disease and self-management techniques.

Physiotherapy aims of treatment in AS

- The aims of physiotherapy management are to:
    - Prevent/minimise deformity
    - Maintain range of movement
    - Maintain muscle power
    - Maintain function and quality of life.
    - Treatment should be adapted to each individual patient and will depend on clinical findings following assessment, such as:
    - Disease activity
    - Pain
    - Deformities
    - Function/disability.
- Physiotherapy intervention will include:
    - Education and self management

– Pain control
– Exercise to maintain/improve: CV fitness, posture, function, range of movement (spinal and peripheral joints), muscle strengthening (including antigravity muscles), and stretching specific muscle groups
– Checking posture, and informing patients about postural awareness and ergonomics.

Patient education

- Patients should be advised not to wear braces, which hold the spine rigid, as they can worsen symptoms. Immobility leads to increased stiffness and pain.
- Patients should be given information regarding the disease, treatment options and self management techniques, e.g. problem solving approaches, in order to improve their quality of life (Bodenheimer et al 2002).
- The patient should have overall responsibility for their management and appropriate self management information and advice will empower them and enable informed choices to be made.
- Patients should be advised about the risks associated with contact sports (e.g. rugby), or sports where there is a risk of falls (e.g. skiing or horse riding), due to the risk of spinal fracture. In impact activities (e.g. netball, jogging and step aerobics), patients should be advised about having good shock absorbing soles on trainers to help lessen the impact on joints.
- Driving may be a problem for patients, resulting in joint stiffness following long journeys, frequent stops to stretch may be useful. Good driving posture can be maintained using cushions. Head-rests need to be correctly positioned as a relatively small impact during an accident could have serious consequences. Patients who have difficulty turning their head, may need to use additional mirrors, car accessory shops will be able to help. Patients are advised to contact the DVLA and their motor insurance company if they have particular problems with rotation.
- Education has been shown to improve self efficacy, which has been described by Van der Linden et al (2002) as a prerequisite for success, with the physiotherapist motivating the patient to follow a suitable exercise programme, which will lead to a better outcome of their disease (Barlow and Barefoot 1996).
- The National Ankylosing Spondylitis Society (NASS) provides an excellent resource for advice, information, updates about the latest research and support for both newly diagnosed and established patients and their families http://www.nass.co.uk.
- Arthritis UK (formally ARC) and Arthritis Care also produce patient information and advice.

Exercise

- AS patients need to remain physically active and an exercise regimen should include a cardiovascular workout as well as specific stretches and strengthening exercises. Patients should aim to get out of breath at least once a day as this is the best form of breathing exercise.
- Ankylosing spondylitis causes inflammation around the joints causing stiffness and pain, which makes it difficult for some patients to exercise.
- Non-steroidal anti-inflammatory drugs are usually prescribed to control these symptoms.
- If joints and muscle pain is controlled by medication, patients will find undertaking exercise much easier.
- The physiotherapist may need to ensure that the patient understands why they have been prescribed the medication they should be taking.
- It is important to remain focused on the core physiotherapy skills relating to advice regarding medication and it may be necessary to refer the patient on to another member of the MDT to discuss this aspect of their management.
- Physical and medical treatments are mutually complementary (Dougados et al 2002).
- Patients should be encouraged to take part in a regular daily exercise programme, with some patients finding that exercise enables them to reduce their intake of medication (Van der Linden et al 2002).
- The Cochrane review on physiotherapy interventions for ankylosing spondylitis (Dagfinrud et al 2008) concluded that physiotherapy exercises were beneficial: exercise, either home based or supervised group physiotherapy is better than no exercise and has been shown to improve movement and physical function.
- Supervised group physiotherapy is better than home exercises and has been shown to improve movement and overall wellbeing.
- Functional disability in AS has been found to progress more rapidly in older patients and smokers, and less rapidly in those who regularly do back exercises and have better social support (Ward 2002).
- Mazen and Khan (2008) advised that, although there have been advances in the pharmacological treatment of ankylosing spondylitis, physiotherapy is still an essential part of its management and recommends that physiotherapy should be included as a vital component in the non-pharmacological management strategy for this disease. They concluded that all patients should receive instructions on posture correction and an exercise programme and be encouraged to perform a programme of exercises in water if possible.
- The provision of physiotherapy and in the most severe cases, inpatient rehabilitation has been shown to be of benefit to patients with ankylosing spondylitis.

Range of movement exercises

- Reduction in all planes of movement throughout the spine can occur in AS, due to the stiffening effects of the disease process.
- Exercises should ensure that the joints are moved through the entire range of available

movement.

- The exercises may have to be modified to accommodate the patient's posture and restricted range.
- It is important to keep patients motivated and to this end incorporate pieces of equipment into the patients routine.
- Breathing exercises should be a regular feature of range of movement exercises, as chest expansion can be limited due to the costovertebral and sternocostal joint becoming involved.
- Jaw stretching exercises should also be encouraged.

Strengthening exercises

- Pain leading to inactivity and postural deformity can lead to weak muscles (Cooper et al 1991).
- Muscle strengthening is necessary to maintain a correct posture.
- The extensor muscle groups of the cervical, thoracic and lumbar spine, lumbar side flexors and thoracic rotators should be strengthened in addition to the abdominal muscles.

Aerobic exercises

- Aerobic exercise conditions the heart and lungs by increasing the oxygen available to the body and by enabling the heart to use oxygen more efficiently.
- Aerobic exercise will also increase resistance to fatigue, increase general stamina and improve mood and therefore improve quality of life and enable patients to carry out their work and maintain an active lifestyle.
- Due to the disease process, many patients have difficulty carrying out impact exercises on land, although low impact exercises are possible, the hydrotherapy pool is an excellent place in which to undertake aerobic exercise, as the impact is significantly reduced.
- Increasing respiratory rate and chest expansion helps to mobilise the thoracic joints.

Aquatic therapy exercises

- Aquatic therapy is an excellent form of treatment for ankylosing spondylitis.
- To further assist or resist buoyancy, floats can be utilised to increase a stretch or make a movement more difficult. Bats or flippers can be used to increase surface area or lengthen a lever to increase resistance to help strengthen muscles.
- Speed of movement through the water can also be used to increase the resistance of the exercise.
- Breathing exercises and team games such as relay races can be incorporated to add variety and improve cardiovascular fitness.
- Water aerobics can also be performed and patients often find this type of exercise more

comfortable in water then on land.
- Refer to the aquatic therapy chapter for more information about treatment ideas.

Muscle stretching

- Muscle stretching is an important part of exercise regimen in ankylosing spondylitis. Prior to stretching, adequate warm-up should take place, or stretching can be done after a shower/bath following the application of heat (Bruckner and Khan 2005).
- Bulstrode et al (1987) describe the contract–relax method of muscle stretching as being useful for lengthening tight muscle tissue with this being suitable to be carried out on land or in a pool.
- Muscles can also be stretched by using a slow prolonged stretch, the stretch being held for a minimum of 15 seconds (Bruckner and Khan 2005).
- Stretching should be pain free and the stretch should be felt in the appropriate part of the muscle being stretched.

Pain control in AS

- As with other inflammatory arthritis heat can help to relieve pain and stiffness.
- Some patients may benefit from a hot bath or shower first thing in the morning and/or before bed, stretching exercises can be done at the same time.
- Hot water bottles or electric blankets may also be useful in bed.
- Ice or cooling can also be used on inflamed areas.
- Soft tissue massage may help relieve muscle tension.
- Pain in AS can be aggravated by inactivity and is often reduced by exercise and patients will often report being woken in the early morning by joint stiffness and pain.
- Exercise, therefore plays an important role in the pain management of AS.

Tai Chi for AS

- Lee et al (2007) have suggested that Tai Chi improves disease activity and flexibility in patients with ankylosing spondylitis following a regular programme of 1 hour of exercise two times per week.

Systemic lupus erythematosus (SLE)

- SLE is often symmetrical non-erosive and usually affects the knees, wrist and proximal interphalangeal joints.
- Clinical features include disorders of the skin, pulmonary and cardiovascular systems, renal function, haematological conditions, neurological problems, fatigue and myalgia.
- Joint subluxation and soft tissue contractures may cause deformities and tendon rupture may occur as a result of tenosynovitis.

- Muscle strengthening and low impact aerobic exercise should be encouraged.
- Caution should be taken when exercising during a flare (Liang 1994).
- Tench et al (2003) demonstrated that exercise helps to reduce fatigue.

Septic joints

- The most serious diagnosis of hot swollen joints is septic arthritis, which can be fatal. Delayed or inappropriate treatment can cause joint damage.
- Patients who present with an acute history of a hot swollen and tender joint should, even in the absence of fever, be treated as a septic joint unless established as otherwise.
- These patients should be referred to A&E urgently or for urgent specialist assessment by a rheumatologist or orthopaedic surgeon for immediate appropriate treatment (Coakley et al 2006).

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Chapter 15

E-materials

Author profiles

Mark Clemence Mphil GradDipPhys MCSP

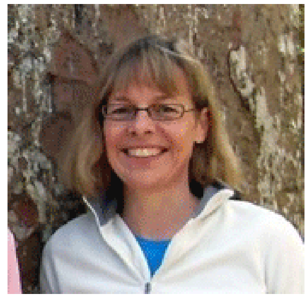
Mark Clemence is a specialist physiotherapist working at Torbay Hospital, Devon.

Mark has had 24 years working within musculoskeletal physiotherapy, and in the last 10 has specialised in rheumatology and hydrotherapy. He has published extensively and previous publications include healthcare journalism, academic papers and reference material.

He regularly participates on the Chartered Society of Physiotherapy's members forum iCSP, for which he is a moderator.

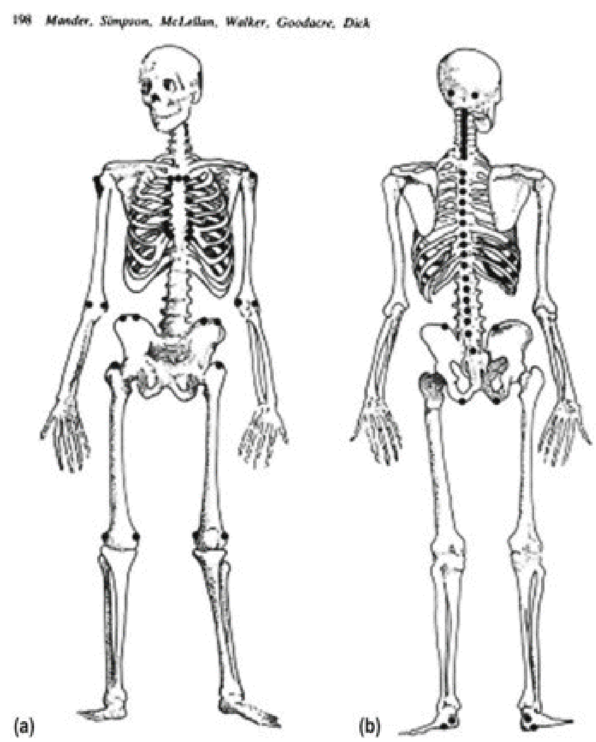
Carole Fruin GradDipPhys Cert. Rheum. Practice MCSP

Carole is currently a specialist physiotherapist in rheumatology and has been involved in the treatment of rheumatology patients for several years. Carole has extensive experience of working in the UK and at the Specialist Rheumatology and Rehabilitation Hospital in New Zealand, at both clinical specialist and ESP level. Carole's special interest is in ankylosing spondylitis and she pays an active role in the running and promotion of the local NASS group.



Appendix 15.1 Entheses examined with patient lying (a) supine, (b) prone

From Mander, M., Simpson, J. M., McLellan, A., et al., 1987. Studies with an enthesis index as a method of clinical assessment in ankylosing spondylitis. Ann Rheum Dis 46, 197–202, with permission of BMJ Publishing Group Ltd.



Appendix 15.2 Useful resources and addresses

Arthritis Care/Young Arthritis Care

18 Stephenson Way, London NW1 2HD
Telephone: 020 7380 6500, Freephone 0808 800 4050

Arthritis Research UK

(Formerly Arthritis Research Campaign) Also provides information for patients and health professionals: http://arhtrisresearchuk.org
Copeman House, St Mary's Court, St Mary's Gate, Chesterfield, Derbyshire S41 7TQ
Telephone: 0870 850 5000

Astretch

A group of physiotherapists, from the UK, who steer the management and improve the understanding of ankylosing spondylitis.
They also provide training in both the assessment and treatment of ankylosing spondylitis. http://www.astretch.co.uk

EULAR

The European League Against Rheumatism: www.eular.org
Aims to promote, stimulate and support the research, prevention, treatment and rehabilitation of rheumatic diseases. Provides evidence to support treatment of a number of rheumatic conditions.

Lupus UK

St James House, Eastern Road, Romford, Essex RM1 3NH
Telephone: 01708 731251

National Ankylosing Spondylitis Society (NASS)

Provides a number of resources for both patients and health professionals to access, including information about assessment, specific exercises and stretches:
PO Box 179, Mayfield, East Sussex TN20 6ZL
Telephone: 01435 873527

http://www.nass.co.uk

National Osteoporosis Society

Camerton, Bath, BA2 0PJ
Telephone: 0845 130 3076; Helpline 0845 450 0230

National Rheumatoid Arthritis Society (NRAS)

Unit B4 Westacott Business Centre, Westacott Way, Littlewick Green, Maidenhead, Berkshire SL6 3RT
Telephone: 01628 823524, Helpline: 0845 458 3969

Case Study 15.1

Background

- SC was a 56-year-old woman who was recently referred to her local NHS Rheumatology department.
- She works as a waitress and was worried because of increasing pain in her hands which had been getting worse over 12 months and was causing her difficulty gripping plates and trays.
- In addition to hand pain she was also experiencing pain in her neck, both shoulders and both first toes.

Initial management

- SC initially consulted her GP, but was seen by a locum, who undertook a rheumatoid factor blood test.
- The results for this were negative, therefore the locum GP advised her that her problems were due to 'wear and tear'.
- She was prescribed non-steroidal anti-inflammatory (NSAID) medication.
- Because things were not improving she returned to see her own GP who made a referral to the local rheumatology department.
- During the time she was waiting for the appointment she experienced further deterioration in her symptoms with increasing stiffness and pain in her hands. This was becoming particularly bad in the mornings, making it difficult for her to dress, with

reducing shoulder flexibility causing problems reaching above her head.

Rheumatology referral

- When she attended her local hospital for a clinic appointment the rheumatologist asked questions that established in detail the nature and behaviour of her symptoms, her family history and her general health.
- Physical examination found her to have a slightly flexed posture and slightly protruding chin, otherwise spinal alignment was normal.
- Bilateral thickening was present over the 2nd and 3rd metacarpophalangeal (MCP) joints, which were tender when squeezed.
- Hand movement was normal, but she displayed reduced grip power.
- Wrists and elbows were normal.
- Bilaterally her shoulder flexion, abduction and internal rotation was slightly reduced.
- Neck movements were symmetrically reduced by about 20% in all directions.
- Hip, knee and ankle joints were normal.
- There was bilateral hallux valgus and stiffness of both first metatarsophalangeal (MTP) joints.
- On the basis of the history and examination the rheumatologist diagnosed seronegative rheumatoid arthritis, also diagnosing osteoarthritis of the first MTPJs.
- The rheumatologist said that he thought that the cervical spine problems were most likely due to degenerative changes.
- He explained that the results of the rheumatoid factor test may have been negative, but the test should not have been carried out in isolation to exclude the diagnosis of rheumatoid.
- SC was clearly showing signs of synovitis in her MCPJs and shoulders and to confirm the diagnosis a blood test for broad-spectrum inflammatory markers was needed.
- This was done along with X-rays of the hands, shoulders and cervical spine, to look for joint erosions and confirm the diagnosis in the cervical spine.
- The X-rays showed cervical degeneration, no changes in the shoulder joints and one small joint erosion of her right 2nd MCPJ.
- Results of the broad-spectrum test showed raised inflammatory markers.
- SC was prescribed a limited and reducing course of steroids to provide immediate symptom relief, and was prescribed the drug methotrexate, which can take up to 12 weeks to achieve therapeutic effect.
- She was referred to the rheumatology team physiotherapist and occupational therapist based in the hospital.
- In addition she was referred to the podiatrist at her GP's surgery for the foot pain.

Physiotherapy intervention

- The physiotherapist undertook an in-depth assessment of all main joint movements and in addition did a detailed assessment of the shoulders.
- The physiotherapist advised gentle range of movement exercises for the shoulders to maintain flexibility, advised the patient about posture correction and neck exercises.
- A follow-up appointment was given to check progress, exercises and provide additional advice.
- SC was reviewed again by the rheumatologist after 3 months and she was also seen again by the physiotherapist to review the progress made.
- There had been a significant improvement in the hands and shoulders, with SC finding it easier to dress and reported having fewer problems when carrying things at work.
- She remains on regular 6-monthly rheumatology clinic reviews and is also seen on an as-needs basis by the physiotherapist when she attends the hospital for these reviews.

Case Study 15.2

ES, female aged 50 years old.

HPC

- Back symptoms since the age of 15 years.
- Previously treated with traction and painkillers 20 years ago.
- Diagnosed with ankylosing spondylitis (AS) 9 years ago.
- Elizabeth was referred by a rheumatology consultant for physiotherapy.

Current problem

- Stiffness, lasting most of the day, mainly affecting her thoracic spine.
- Some thoracic spine pain, but stiffness more of a problem.
- Fatigue.
- Understanding of disease and disease process was limited and based on patient's own experience of symptoms.
- She has "got on with life" as she has had back symptoms for such a long time.
- Stiffness, when inactive, better when active.
- ES wakes approx 4:00 am with increased back stiffness and discomfort.
- No physiotherapy since being diagnosed with AS.

PMH

- Fractured ribs as a teenager after being kicked by a horse.
- No iritis, normal bowel functions, no skin problems, no depression.

- Bone mineral density: Hips: osteopenia −1.5, lumbar spine: normal (lower range) −0.7.
- Nil else of note.

Drug history

- Neurofen plus.
- Intolerant of most other anti-inflammatories.

Family history

- None of note.

Social history

- Owns a cattery, which is very busy. She wanted to keep working.
- Enjoys horse riding, but was unable to do this due to back pain and stiffness. This was something she wanted to do again.
- Swimming twice per week.

Assessment

- Weight: 68 kg.
- Height 168 cm.
- Protracted shoulders and chin.
- Chest expansion 2.5 cm.
- Tragus to wall: 13.0 cm.
- Lumbar flexion: 0.5 cm.
- Cervical rotation: 65°.
- Lumbar SF: 4.5 cm.
- Intermalleolar distance: 105 cm.
- No swollen or tender joints noted.
- Bath Ankylosing Spondylitis Measurement Index (BASMI) 4.2/10 indicating moderate–severe disease involvement.
- Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) 9/10 indicating severe disease activity.
- Bath Ankylosing Spondylitis Functional Index (BASFI) 7.5/10 indicating significant loss of function.
- Spinal pain in the last week 6/10.

Problems

- Thoracic spine stiffness.
- Thoracic spine pain.
- Fatigue.
- Limited knowledge of disease and management.
- Reduced function BASFI 7.5/10.
- Active disease ASDAI 9/10.

Patient goals

- Continue to work.
- Continue to go swimming.
- Start riding her horse again.

Medication

- ES was experiencing the active disease, it is appropriate to suggest that the patient is reviewed by the rheumatologist, so that their medication can be re-evaluated, in order to reduce the stiffness and pain.
- In the case of ES this had been done by the referring consultant.
- Reducing the disease activity will enable the patient to undertake regular exercise and activity.

Education

- Education about the disease and its self management was important for this patient.
- Support from other AS patients may also be helpful.
- ES was given details about NASS, contact with the local NASS group and informed where further information and support could be found.
- Advice about heat and the use of TENS was discussed.
- Pacing and rest/relaxation was addressed.
- Further discussion about function took place to aid the provision of suitable exercises, e.g. putting on socks was difficult, an exercise to help with hip and knee flexion was provided. Some patients may require assistive devices.
- The importance of regular daily exercise was explained and actively encouraged.

Exercise

- An individualised programme of exercise was provided for the patient. Exercises were

progressive and included warm-up exercises, strengthening, stretching and finishing with a cool down.

- ES was given strengthening exercises working the muscles against gravity.
- Stretching exercises were given, in particular for the thoracic spine.
- Pelvis, hips, shoulders and chest expansion exercises were also taught.
- Not all the exercises need to be done at the same time, they were planned to fit into the individual's daily routine.
- Posture and postural awareness was addressed.
- ES's daily activities in relation to her work were discussed and where possible movements and stretches were incorporated into her daily working routine.

Other treatment options

- As ES swims on a regular basis, hydrotherapy could be considered as an option.
- This may assist in developing exercises and stretching and may also help with pain management.
- Swimming should be encouraged, however, varying the swimming stroke can reduce the risk of stress and fatigue in joints.

Case Study 15.3

NG, male aged 24 years.

Background

- NG was diagnosed with rheumatoid arthritis aged 20 years.
- He did well on combined disease-modifying anti-rheumatic drugs (DMARD) therapy such as methotrexate, sulfasalazine and leflunomide.

Currently

- NG reports that his right elbow is the main problem, he feels it has been a problem on and off since the diagnosis of his disease.
- He feels it became worse following an operation for a tendon rupture in the right hand.

PMH

- 2005: ruptured extensor tendons right wrist, repaired.

Drug history

- Currently taking:
  - Naproxen
  - Methotrexate
  - Previously has had sulfasalazine (stopped this of his own accord)
  - No steroids or anticoagulants.

Social history

- Finished MSc, started a PhD.
- Currently trying to work for his PhD – using computer.
- Not much activity, likes socialising, has done swimming and walking in the past, would like to do some kind of activity.

Observations and examination

Right elbow

- Mild effusion noted no heat or redness seen.
- Flexion to 65°.
- Extension (cannot fully straighten elbow) fixed flexion of 55°.
- Therefore only has 10° of movement.
- Supination nil.
- Pronation 5°.

Left elbow

- Flexion full.
- Extension fixed flexion of 25°.
- Supination 15°.
- Pronation 20°.

Other joints of the upper limbs

Hands and wrists

- There was good function bilaterally.
- Some reduced movement of the thumb; however, there is good function.
- Full finger flexion bilaterally, full opposition and good power pinch and tri-pod grips were noted bilaterally.

Shoulders

- Function, difficulty getting hands to the back of his head and bottom of his back on the right.
- Can just about get hand to mouth on the right.
- There is reduced range of movement at both shoulders than would be expected for a male of this age.
- Movement loss is more marked on the right.

Patient reports that reaching up to get objects from high shelves/cupboards has become more difficult recently; reaching into his back pocket is also a problem. Patient is finding that function in the right arm generally is worsening, more recently over the last 3–4 months, during this time he has become generally less active than he has ever been.

Good muscle power to resisted muscle testing at the elbow and wrist; however, it was noted that resisted elbow flexion and extension on the right were painful and therefore, appeared weaker than on the left.

Pain could be the reason for the apparent weakness on the right.

Cervical spine was cleared, upper limb reflexes were intact.

Further testing, in the form of nerve conduction studies, did not indicate any problem with the nerves in the right arm; it is likely that the apparent weakness was due to pain rather than true muscle weakness. Distinguishing between painful joints and true muscle weakness can be a problem when assessing patients with painful, inflammatory disease and care should be taken.

X-ray right elbow and hands

- Elbow: joint effusion, advanced loss of joint space.
- Hands: erosive change is seen involving the wrist and intercarpal joints. There is moderate juxta-articular osteoporosis.

Main problems

- Reduced range of movement in the right elbow.
- Reduced range of movement and function in the right shoulder (probably rotator cuff involvement and possibly changes in the glenohumeral joint).
- Painful right elbow.
- NG feels that all aspects of his life are becoming more difficult, his social life, activities of daily living and studies are restricted.

Patient goals

- Reduce pain.

- Improve function in the right shoulder.
- Improve range of movement in the right elbow.
- Increase general activity/exercise.

The rheumatologist advised NG regarding his medication for pain control.

Physiotherapy treatment

The reduced range of movement at the right elbow and shoulder, which combined, were making it difficult for NG to use his right arm functionally.

Even if no further range could be gained at the elbow, the range of movement at the shoulder should be optimised in order to retain good function and treatment was based around this.

Range of movement exercises for the shoulder and elbow were advised along with progressive strengthening exercises for these joints.

Posture correction was also included and advice was given regarding posture while working/studying.

Pacing was discussed to enable NG to conserve energy for the activities he really enjoyed and did not want to miss out on.

NG was referred to the hydrotherapy pool to further aid with increasing range of movement and muscle power at the elbow and shoulder.

NG was advised about the use of heat to help with his pain control and general joint discomfort.

Despite tendon problems in the right hand, wrist and hand function were good, joint protection was discussed and referral to the occupational therapist was made and advice was given regarding suitable assistive devices to help with upper limb function.

The occupational therapist was also able to advise on computer adaptations and was able to provide NG with pen adaptations to ease pressure on the joints in NG's hands when writing.

NG was keen to return to some kind of regular exercise and was initially provided with some general strengthening exercises to start at home. NG was also advised about starting a progressive walking programme, which enabled him to attend the gym locally in Bristol.

Outcome

- Unfortunately NG's right elbow deteriorated rapidly and despite physiotherapy treatment, very little improvement in range of movement was obtained.
- However, the shoulder responded well to treatment and despite the reduction in elbow movement, the right shoulder now has good function.
- NG is likely to require an elbow replacement at some point, the range of movement has not deteriorated and pain appears to be under control.

- Hand function remains good.
- NG now exercises on a reasonably regular basis going to the gym and walking around town, he is managing his studies and social life well.

Chapter 15 Rheumatology multiple choice questions

1. Which of the following is not normally associated with rheumatoid arthritis?
    a). Synovitis
    b). Joint effusion
    c). Dactylitis
    d). Pain
2. In the majority of patients ankylosing spondylitis begins in the ...?
    a). Lumbar spine
    b). Thoracic spine
    c). Costochondral joints
    d). Sacroiliac joints
3. Which joint(s) are not normally affected by rheumatoid arthritis?
    a). Lumbar spine
    b). Cervical spine
    c). Shoulders
    d). Metacarpophalangeal
4. The definitive diagnostic test for rheumatoid arthritis is ...?
    a). Rheumatoid factor
    b). Plasma viscosity
    c). Erythrocyte sedimentation rate
    d). None of these is definitive on its own
5. NICE guidelines for inflammatory arthritis recommend
    a). Long-term treatment with oral steroids
    b). Early referral to secondary care in suspected cases
    c). Undertaking all investigations in primary care before referring to secondary care
    d). Early treatment with vitamin D
6. In the majority of patients EARLY ankylosing spondylitis is not normally associated with ...?
    a). Cervical syndesmophytes
    b). Morning stiffness
    c). Stiffness after sitting
    d). Buttock pain
7. The non-articular condition most commonly associated with ankylosing spondylitis is ...?
    a). Iritis
    b). Peripheral neuropathy
    c). Pulmonary hypertension
    d). Abdominal aortic aneurysm

8. Which of the following is considered a spondyloarthropathy?
   a). Rheumatoid arthritis
   b). Reactive arthritis
   c). Gout
   d). Osteoarthritis
9. Which of these members of the rheumatology multidisciplinary team is most likely to become involved in the treatment of ankylosing spondylitis?
   a). Rheumatology nurse
   b). Physiotherapist
   c). Podiatrist
   d). Occupational therapist
10. In current theory the onset of which of the following is not considered to be associated with an abnormality in the immune system?
   a). Rheumatoid arthritis
   b). Ankylosing spondylitis
   c). Osteoarthritis
   d). Reactive arthritis
11. In the hand which two types of arthritis will most commonly tend to affect the distal inter-phalangeal joints?
   a). Rheumatoid arthritis and osteoarthritis
   b). Rheumatoid arthritis and ankylosing spondylitis
   c). Psoriatic arthritis and osteoarthritis
   d). Psoriatic arthritis and rheumatoid arthritis
12. Which of the following types of drug is not NORMALLY used for long-term treatment of rheumatoid arthritis?
   a). NSAIDs
   b). Oral steroids
   c). DMARDs
   d). Anti-TNF agonists
13. Early psoriatic arthritis is not associated with ...?
   a). Ulnar deviation
   b). Dactylitis
   c). Sacroiliitis
   d). Plantar fasciitis
14. HLA B27 blood test will most commonly be used to confirm the diagnosis of ...?
   a). Rheumatoid arthritis
   b). Osteoarthritis
   c). Gout
   d). Ankylosing spondylitis
15. Which of the following statements should be considered false?
   a). Osteoarthritis and rheumatoid arthritis can simultaneously affect the cervical spine
   b). Osteoarthritis and ankylosing spondylitis can simultaneously affect the lumbar

spine

c). Osteoarthritis and ankylosing spondylitis can simultaneously affect the cervical spine

d). Rheumatoid arthritis and ankylosing spondylitis can simultaneously affect the cervical spine

16. The areas least likely to show early changes of rheumatoid arthritis on X ray are ...?
    a). Metacarpophalangeal joints
    b). Metatarsophalangeal joints
    c). Hip joints
    d). Wrist joints
17. What do the conditions ankylosing spondylitis, psoriatic arthritis, reactive arthritis and enteropathic arthritis have in common?
    a). They will always test HLA B27 positive on blood test
    b). They will always be associated with enthesitis
    c). They will always be associated with syndesmophyte formation
    d). None of the above
18. In the absence of an inflammatory arthritis, osteoarthritis is not normally associated with ...?
    a). Synovial proliferation
    b). Increased synovial fluid formation
    c). Articular cartilage reduction
    d). Osteophyte formation
19. The drug methotrexate is not thought to help ...?
    a). The proximal interphalangeal joints in rheumatoid arthritis
    b). The lumbar spine in ankylosing spondylitis
    c). The cervical spine in rheumatoid arthritis
    d). The metatarsophalangeal joints in rheumatoid arthritis
20. In modern rheumatology practice, which of the following areas affected by rheumatoid arthritis is least likely to be immobilised through regular use of splints or orthoses?
    a). Wrist
    b). Distal interphalangeal joints
    c). Cervical spine
    d). First metacarpophalangeal joints

Rheumatology multiple choice answers

1. c)
2. d)
3. a)
4. d)
5. b)
6. a)
7. a)

8. b)
9. b)
10. c)
11. c)
12. b)
13. a)
14. d)
15. d)
16. c)
17. d)
18. a)
19. b)
20. c)

Chapter 16

Spinal Cord Injury

- Patients with a spinal cord injury (SCI) are usually managed within a specialist unit, by an interdisciplinary team.
- Patients with a SCI may present at a local hospital, e.g. most new cases present to the accident and emergency (A&E) department of a district general hospital, whilst patients with an established injury may be admitted to a local hospital during a period of acute deterioration or require ongoing input following discharge from a specialist unit.
- Physiotherapy plays an essential part in the management of patients from the acute phase through to end stage rehabilitation.
- Interventions include the teaching of physical skills and coping techniques that someone with a SCI will need, to regain their independence within the community.
- Many of the techniques employed are not specific to SCI rehabilitation, but are methods widely used within cardiorespiratory, musculoskeletal, orthopaedics and neurology rehabilitation, albeit applied to the SCI population.
- Thorough assessment and re-assessment is the key to developing an appropriate and effective treatment plan.
- It must be remembered, however, that along with disturbance of motor function and sensation, many other body systems may be affected and careful consideration of the impact of therapy upon these systems is required.

Aims of rehabilitation

- A spinal cord injury is considered to be one of the most devastating conditions that can occur following a trauma.
- In seconds an individual is catapulted from a familiar life as an able-bodied person into a previously unknown situation and an environment of, in most cases, permanent disability.
- Rehabilitation therefore needs to address not only the physical aspects, but also the psychological aspects that occur following a spinal cord injury.
- Whilst in the acute stage the individual will for various reasons often not fully understand the enormity of the changes to their life.
- During mobilisation, rehabilitation and community re-integration the impact of loss of muscle power, sensation, movement, bladder, bowel, temperature control and sexual function in daily life will become clear.
- Adjustment to the injury is a lifelong process in which constant changes occur in the

patient, their circumstances and needs; support thus needs to begin soon after injury (Bromley 2006).

- Rehabilitation aims to provide the individual with the knowledge, physical skills and coping strategies that are required, whilst developing their ability to regain the control of their life that may have been lost after the initial injury.

Goal planning

- Goal planning aims to place the patient at the centre of their rehabilitation programme, whilst increasing their engagement in rehabilitation activities (Kennedy et al 1991).
- It is based on the patient being an active participant in their rehabilitation and aims to recognise and utilise the patient's strengths in order to meet their own identified needs.
- Goals are set with the rehabilitation team, specific measurable and realistic targets being defined to be achieved in an agreed time.
- Regular review and monitoring of success can become an empowering process.
- Areas of unmet needs can be recognised and addressed and the roles and contribution of the various health care professionals can be clarified.
- The need to address all areas affected by the SCI throughout rehabilitation is essential if the process is to be considered as one of learning and development of new skills and knowledge.

Functional goals of rehabilitation

- A knowledge of the anticipated functional outcome and physical independence in activities of daily living allows targets to be set to assist the patient achieve their physical goals.
- It also provides a structure for the team to work towards in conjunction with each patient and supports the goal planning framework.
- Goals are strongly influenced by the level of the spinal cord injury and the remaining innervated muscles (Appendix 16.3, number 6, p. 397).

Factors that may affect rehabilitation

- The extent and speed of progression through rehabilitation and the final goals achieved will be influenced by:
  - Age
  - Level of lesion
  - Completeness/incompleteness of the lesion
  - Any associated injuries

– Previous medical history
– Degree of spasticity
– Morphology of the individual
– Psychological factors, e.g. motivation, locus of control, depression, etc.
– Pain.

Acute physical/medical management

Road side/initial management of acute trauma

- The highest proportions of patients with a SCI will have been involved in a fall or road traffic accident.
- At the scene of the injury, initial attention is focussed on maintaining the airway, breathing and circulation (ABC).
- In an actual or suspected SCI, a jaw-thrust/chin lift technique is used to maintain a patent's airway rather than extension of the neck (ACS 2006).
- Once considered safe, extrication and transfer to the closest accident and emergency (A&E) department is conducted with 'full body spinal protection' established.
- This utilises a cervical collar, spinal board and head restraint (Harrison 2007).
- All unconscious or multitrauma patients with the potential for SCI are treated prophylactically as if they have injured their cord.
- The management of the individual will commence immediately to address the multisystem impairments that are secondary to SCI and to prevent avoidable complications.
- Conservative management is followed initially, using postural reduction with or without traction to align the vertebral column.
- Respiratory support is provided if required, regular turns are instigated for the management of the skin and a regimen of treatment for the care of the paralysed bladder and bowel is commenced.
- Patients may be sedated or require admission to the intensive therapy unit (ITU) for multisystem management.
- A variety of medications may be used to control the effects of a damaged spinal cord, including those to alleviate pain, treat infections or anticoagulation therapy to prevent the formation of a deep vein thrombosis.
- It is no longer standard practice to offer high-dose methylprednisolone for spinal cord swelling (Short et al 2000), but this may still be seen in some district general hospitals.

Management of the spine

- The duration of bed rest depends on the type and cause of injury, the degree of spinal instability, the method of management, i.e. conservative or surgical and medical stability.
- The principles of management of the spine are to:
  - Enhance neurological recovery
  - Avoid neurological deterioration
  - Achieve biomechanical stability of the spine at the site of the impairment, preserving spared neural tissue until healing occurs (Bromley 2006).
- The decision to manage the injury conservatively or surgically is multifactorial and dependent upon experience and ability of the medical team.
- There appears to be no difference in outcome between surgical and conservative management, although surgery may be associated with greater complications El Masry & Jaffray (1992).
- Patients with non-traumatic injuries are usually mobilised as soon as they are medically stable.

Conservative management

- Patients with traumatic injuries may be treated with a minimum of 6 weeks bedrest. An X-ray and computerised tomography scan (CT) of the spine will decide whether further bedrest is indicated. The total bedrest period may be 10–12 weeks in an uncomplicated case.
- Dislocations are usually treated with postural reduction, using pillows for the thoraco-lumbar lesions and neck roll and skull traction for the cervical lesions (Figures 16.1 and 16.2).
- Skull traction is usually maintained for 6 weeks, and is dependent thereafter on a CT taken to check the position and degree of bony callus formation.
- If further bed rest is indicated, the position of the neck will typically be maintained by using a neck roll or hard collar.
- If Halo-traction with a vest is used, the patient can be mobilised earlier, but the Halo traction will be maintained for at least 12 weeks post-injury.

Figure 16.1 Cervical spine immobilisation using head blocks.

Figure 16.2 Cervical spine immobilisation with skull traction.

Surgical intervention

- Surgical management of a traumatic injury will greatly reduce the period required on bedrest.
- The type and length of internal fixation used will vary depending on the site, number of levels involved and severity of the injury.
- The length of the fixation should be kept to a minimum by the surgeon and usually should extend just one segment above and below to prevent additional complications, e.g. reduced range of movement in the spine caused by the implant.
- The postoperative bedrest period can vary, but is typically 1 week.

Physiotherapy assessment and treatment planning

- The overall purpose of physiotherapy for patients with spinal cord injury is to improve health-related quality of life through improving their ability to participate in activities of daily life (Harvey 2008).
- The accurate identification of the factors impacting on the person's ability to participate is achieved through assessment and re-assessment and is the key to successful management.
- Assessment tools are numerous and should be used to monitor and measure progress.
- The International Classification of Functioning, Disability and Health (ICF) can be used to facilitate the process. The reader is referred to Chapter 16 in Volume 1 (World health Assembly, 2001).

Acute physiotherapy management and rehabilitation

- The initial bed rest phase will be experienced by all individuals with a spinal cord injury.
- The duration will vary greatly dependent on cause, impairment and management.
- This period demonstrates a period where intervention is deemed essential to influence respiratory and life-threatening conditions.
- This is also an opportunity for many patients to commence rehabilitation and education, albeit in a limited capacity.
- The physiotherapeutic aims of acute management of an individual with a spinal cord injury are:
  - Maintain and progress respiratory function
  - Joint management and prevention of contractures
  - Maintain muscle strength and strengthen partially innervated muscles
  - Development of compensatory movements in some instances (e.g. 'trick' elbow extension)
  - Prevention, early identification and management of complications.

Maintenance and progression of respiratory function

- Pulmonary complications in spinal cord injury are common and are directly correlated with mortality. The higher the level of neurological injury, the more complications are likely (Bromley 2006).
- Respiratory physiotherapy aims include:
  - Improve ventilation and gas exchange
  - Reduce airway obstruction – 'plugs'
  - Promote sputum mobilisation and expectoration

  - Improve force and endurance in both inspiratory and expiratory muscles
  - Maintain chest wall compliance
  - Develop ventilatory reserve to cope with increased activity and infection.
- Prophylactically patients should be offered breathing exercises, preferably using an incentive spirometer to provide 'biofeedback'. (assisting re-education of preserved respiratory musculature)
- Mechanical ventilation is considered when the vital capacity drops below 1 litre, and is essential below 500 mL (CSCM 2005). The use of intermittent positive pressure breathing (IPPB) should be considered for preventative treatment of patients with low vital capacities. It is also a useful tool to teach the ultra high lesion how to 'rescue breathe' with their upper accessory muscles when off the ventilator by manipulating the 'sensitivity' dial.
- Abdominal binders should be used by patients without abdominal innervation when upright. This prevents the typical postural drop in vital capacity seen in the majority of SCI patients (Prigent et al 2010).
- Sputum clearance techniques should be taught to the patient or their family/carers when assistance is required. A peak cough flow (PCF) of 160 L/min is deemed essential for clearing airways, with values greater than 270 L/min ensuring a reduction in respiratory infections in the neurologically impaired (ATS 2004). This is difficult to achieve for many patients without innervation of the abdominal muscles and those with low vital capacities. When this is the case, a manual-assisted cough or use of the cough assist machine is recommended (BTS 2009).
- Respiratory deterioration can occur due to any number of reasons, e.g. ascending neurology, respiratory muscle fatigue, abdominal distension, over sedation, excessive IV infusion, respiratory infection, aspiration or even enforced smoking cessation (Dicpinigaitis et al 2006).
- When deterioration does occur, fatigue will be an issue, a 'little and often' approach is suggested.
- Close liaison with the medical team is necessary, the physiotherapist is encouraged to use a combination of humidified oxygen, postural drainage, breath augmentation, e.g. IPPB, manual hyperinflation or cough assist machine, and sputum clearance techniques, e.g. assisted cough timed with suction, for those whom can't clear to the mouth.
- Early implementation of Non-Invasive Ventilation (NIV) or mechanical ventilation is advised with rising $PaCO_2$, prior to respiratory arrest, to protect the healing spinal cord (Gardner et al 1986).
- Early tracheostomy is advocated for those difficult to wean from invasive ventilation (Harris 2007).
- Suction must be approached with caution in tetraplegia during the period of spinal shock. Unopposed vagal tone due to the parasympathetic dominance evident in this patient population predisposes the patient to bradycardia and potentially sinus arrest (RCP 2008). Pacemaker insertion should be avoided due to the fact this presentation typically resolves naturally as spinal shock passes and a pacemaker would contraindicate any

future MRI scans. It is better managed with pre-oxygenation and prophylactic sympathomimetics such as glycopyrrolate. It does not contraindicate chest physiotherapy, as omission would invariably lead to respiratory failure.

- Weaning from ventilation is a team approach and should be gradual due to respiratory muscle fatigability.
- An approach of progressive ventilator free breathing has been shown to be twice as effective as the typical approach of decreasing pressure support, as used in the general population (Peterson et al 1994).

Joint management

- The outcome of the rehabilitation depends very much on maintaining adequate range of movement (ROM) and muscle length in the affected joints during the bed rest period.
- Prolonged periods of bed rest, pain, spasm, lack of regular repositioning and unopposed muscle activity can lead to muscle contracture and joint stiffness.
- The results of contracture development may include functional dependence, inhibited goal achievement, pain, pressure sores, difficulty to seat, increased carer load, increased spasms, respiratory compromise and a poor body image.
- In some cases it may be necessary to try to increase the 'normal' ROM in a joint to enable the patient to achieve certain functional goals later on, e.g. increased external rotation of the hip with knee and hip flexion ('tailor position') for dressing, or increased elbow extension with wrist and shoulder extension for weight bearing without triceps innervation.
- Positioning:
  - Sustained stretch through positioning can help prevent length-associated changes and contractures in muscle.
  - A 24-hour positioning programme should be devised for both the acute and rehabilitation patient and discussed with the nursing staff.
  - Thorough assessment should help to identify the assistance required to facilitate and maintain these positions and the length of time tolerated (Figures 16.3, 16.4 and 16.5).
- Passive and active movements:
  - Passive/active assisted movements must be applied in a controlled and rhythmic manner, fully supporting joints, as paralysed structures can easily be damaged.
  - Wherever a patient has some control of movement, guided active participation should be encouraged.
- Adequate analgesia needs to be provided.
- Education of the patient and family in how they can assist the process should be part of the treatment consideration.
- Close liaison with the occupational therapist is advocated to manage the special requirements of the upper limb ensuring there is co-ordination of goals and treatment.
- In order to maintain full and pain-free range in the shoulder, mobilisation of the scapula

and accessory movements to the shoulder and clavicular joints are indicated prior to physiological ranging.

- While mobilising the shoulder, great care must be taken not to move the cervical spine.
- The following movements should be carried out:
  - – Depression of the shoulder, required for lifting activities, maintained by daily bilateral stretches of the upper trapezii
  - – Bilateral shoulder adduction prevents shortening of the rhomboids
  - – Pectoral stretch
  - – *Full shoulder flexion, including above 90°, unless pain is caused at the fracture site*
  - – Elbow flexion involves stretching of long head of triceps from 90° shoulder flexion or full elevation
  - – Elbow extension with full wrist extension with the arm by the side of the body. A C5/6 will not be able to lock the elbow when attempting to take weight through the arms without this. If a tenodesis grip is being encouraged and developed the fingers must be allowed to flex during this stretch
  - – Elbow extension with supination and pronation. Loss of supination compromises the lifting position for transferring. Loss of pronation compromises the potential for hand–mouth activities and a successful tenodesis grip.
- In patients with unstable lesions of T10 and below being managed conservatively or awaiting surgery, hip flexion is initially restricted to 30° in order to avoid excessive movement of the lumbar spine.
- The movement must always avoid pain at the fracture site.
- Full knee flexion is maintained with unilateral tailor position (full external rotation of the hip with limited hip flexion and full knee flexion). Rotation of the pelvis must be monitored during this movement.
- Further lower limb movements should be carried out as follows:

– Accessory movements to the metatarsal joints help to prevent deformity of the foot, which might otherwise cause pressure problems when wearing shoes and during standing.

– Adduction across midline with a straight leg.

– Abduction to the edge of the bed only (max. 45°).

– Mobilise the patella before flexing the knee.

– Extension of the hip (hip stretch) is necessary for all incomplete lesions with the potential to walk and complete lesions with the potential to use callipers, but should not be commenced without prior discussion and agreement with the consultant.

– This is achieved by placing the patient in side lying after 2–3 weeks post-injury, depending on the fracture.

– When carrying out the movement, the pelvis must be stabilised, the knee flexed to 90° with the hip in neutral rotation with no abduction or adduction.

– Particular vigilance is needed for patients with T12/L1 levels because of possible unopposed active hip flexion.

- Hamstring stretch is not usually carried out until 6 weeks post-injury because of the pull

on a healing spinal cord.

- This should not be initiated without prior discussion with the consultant.
- If carried out while the patient is still on bedrest, the straight leg raise is restricted to 60°.
- There are a range of other options available to a physiotherapist to maintain joint range and function:
  - Splinting
  - Bio feedback
  - Functional electrical stimulation
  - Accessory joint movements
  - Soft tissue release
  - Spasticity management (medication, positioning and ranging to avoid increase in tone).

Figure 16.3 'Unilateral crucifix' used to achieve shoulder abduction and external rotation, with elbow extension and forearm supination in tetraplegia.

Figure 16.4 The contralateral upper limb should be placed with the shoulder by the side, elbow extended, forearm pronated, with elevation distal to the elbow being delivered by a 'ski-jump' pillow to minimise dependant oedema. Care should be taken not to allow the shoulder to fall into protraction and extension.

Figure 16.5 Use of pillows or pressure-relieving ankle foot orthosis (PRAFOs) should be encouraged to maintain a plantargrade ankle.

Maintenance of muscle power and strengthening of partially innervated muscle groups

- Post spinal cord injury a number of problems can often be identified with muscle strength within the same individual: complete paralysis, partial paralysis of a muscle and neurologically intact muscles which can be functionally weak and/or deconditioned.
- The appropriate intervention for the partially paralysed muscle or the neurologically intact muscle is the development and instigation of a strengthening programme.
- A strengthening programme can commence during the acute phase using all remaining partially innervated or intact muscles, e.g. high cervical lesions may undertake sling suspension or assisted exercises, whereas weight training/Thera-Bands may be appropriate for paraplegics.
- With all patients care must be taken to ensure excessive effort does not cause movement of the fracture site, encourage spasticity or develop unwanted compensatory strategies.

Development of desired compensatory movements

- The time spent in the acute phase on bedrest can be used to commence the development of appropriate compensatory movements, the most notable being trick extension of the elbow (elbow extension without triceps activity) and tenodesis grip.

Trick extension of the elbow

- This movement can be taught to C5 or C6 spinal cord injured patients without triceps activity to prevent shortening of the biceps tendon and to aid functional upper limb movement.
- To achieve trick extension the patient must learn to relax biceps in combination with lateral rotation and protraction of the shoulder and allow gravity to extend the elbow.
- Shoulder flexion without elbow flexion ('straight arm raise') is also a skill that should be promoted for function.
- Development of this skill does not hinder recovery of triceps activity.

Tenodesis grip

- The tenodesis grip should be developed in individuals with a C6 or C7 spinal cord injury.
- It utilises flexion of the wrist by gravity and passive extension of the fingers to open the hand around an object whilst in forearm pronation. Active wrist extension places passive tension on the long finger and thumb flexors, enabling an object to be picked up. The efficacy of this movement can be improved by allowing the finger flexors and thumb web space to shorten.
- Early development of the tenodesis grip through shortening of the finger flexors continues to be controversial.
- Unlike trick extension of the elbow, development of tenodesis grip can limit recovery of the finger extensors due to the shortening of the finger flexors and this can hinder the development of a 'normal' grip and release pattern where recovery has been demonstrated. This can be managed nonetheless where evidence of neurological recovery exists by splinting and re-education.

Identification and management of complications

- A physiotherapist will maintain close, regular contact with the patient throughout the period of acute management and rehabilitation and therefore is often able to identify complications at an early stage.
- The complications most frequently encountered and managed by physiotherapy will be discussed.

Deep vein thrombosis (DVT)

- DVTs most commonly occur in legs, but can also appear in the arms.
- If a DVT is suspected or diagnosed, passive movements to both legs or arms are discontinued until therapeutic anticoagulation is achieved.

Pulmonary embolus (PE)

- Passive movements to the legs or arms may dislodge an undiagnosed DVT.
- If a patient complains of sudden, sharp chest pain and breathlessness passive movements must be stopped immediately and the medical team informed.

Heterotrophic ossification (HO)

- The physiotherapist is often the first member of the team to identify the development of bone in the connective tissues, most commonly around the hips, knees and elbows.
- Often the first indication of ossification is a different end-feel to a joint or raised infection markers.
- There may be swelling, redness and increased temperature in the affected joint or muscle group. One cause of HO is thought to be minute trauma to tissues that have experienced rough, jerky handling.
- The range of movement is greatly at risk in the affected area and it is crucial to maintain at least functional range, i.e. minimum 90° at hips and knees to achieve a good sitting position.
- Initially passive movements are discontinued until the inflammation has subsided, and then recommenced with care, ensuring that there are no forced movements.
- As the initial tissue reaction settles range of motion is increased through positioning and passive movements.
- Regular monitoring of the range of movement is important.
- Drug therapy using bisphosphonates may sometimes be indicated.

Swelling

- Following spinal cord injury swelling tends to occur for two reasons:
- Overstretching of ligaments and joint injury in the unprotected joint.
  - This tends to be due to poor positioning, i.e. hyperextension of the knees whilst on bed rest or during activities such as standing and gait re-education where the joint is not fully protected due to weakness, e.g. weakness of the hamstrings resulting in knee hyperextension.
  - Careful positioning with adequate support to the legs will prevent this during the bed rest phase, whilst consideration to positioning and the appropriateness of an orthosis needs to be considered during standing and gait re-education.
- Postural/gravitational oedema.
  - This tends to be due to poor vasomotor control, altered muscle tone and excessive administration of intravenous fluids.
  - It can occur in either the hands or feet.
  - If it is not managed and dispersed, collagen deposits can change into fibrous tissue and limit joint movement.
  - Management is essential through elevation, passive movements and application of compression garments such as elastic stockings.

– If splints are used, they should be reviewed to prevent pressure areas forming.

Spasticity

- If excessive spasticity develops, passive and active movements, stretches and mobilisations may have to be modified and/or increased.
- Prolonged passive stretching and reflex inhibitory postures may be useful to break a dominant pattern, e.g. hipflicks and 'frog' position.
- If the individual is mobilising, then weight bearing through standing and/or walking can help.
- The degree of spasticity should be monitored and communicated to the other members of the team.
- Drug therapy is often useful to manage this.

Pain and painful shoulders

- Pain is a common complication following SCI which can limit participation in rehabilitation, the ability to perform functional activities and impacts on quality of life.
- Kennedy et al (1998) found that 'pain at 6 weeks post injury is the strongest predictor of pain at one year post discharge.'
- It therefore can have a significant impact on the person with spinal cord injury at all stages post injury.
- The location, intensity, time since onset of spinal cord injury, duration and cause are highly variable.
- Correct identification of the cause of pain, e.g. nociceptive or neuropathic and early management is important.
- Shoulders have been widely documented as being a common site for pain following spinal cord injury.
- The incidence of shoulder pain in acute tetraplegia has been reported to range from 51% to 78% (Crowe et al 2000, Mackay-Lyons 1994, Waring and Maynard 1991, Lee and McMahon 2002) and as high as 85% during rehabilitation (Salisbury et al 2003).
- Pain has been reported to be a potential barrier to recovery of upper limb function and independence (Mackay-Lyons 1994).
- Education, correct positioning and frequent changes in positioning of the arm are important factors in preventing shoulder pain.
- Close liaison with the medical team is essential for appropriate analgesia provision.
- Patients should be encouraged to move the arms actively as much as possible and as early as possible.
- Maintenance of accessory movements and involvement of the scapula during passive and functional tasks (even when carried out by a carer) is essential to pain-free range.

Mobilisation

- In spinal cord injury rehabilitation, mobilisation usually refers to the period when the patient moves from bed rest to the wheelchair in preparation for active rehabilitation.

The first mobilisation

- The initial mobilisation of an individual requires the co-ordinated approach of the whole team to ensure the process is a safe and smooth transition.
- The process will be started by the medical team when the individual is deemed stable and fit to mobilise and a date for first mobilisation into the wheelchair will be defined. In some instances mobilisation may need to occur with a collar or brace applied.
- Nursing staff will usually start to sit the patient up in bed, gradually increasing the duration and degree of elevation over a period of a few days prior to actual mobilisation.
- It is the role of either the physiotherapist or occupational therapist to provide a suitable wheelchair for first mobilisation.
- Measurements, i.e. hip width, thigh and calf length and back height will need to be taken to ensure the correct size wheelchair is provided.
- The type of wheelchair is dependent upon the level and completeness of injury, which will depict the degree of support required and if other aspects are required, e.g. tilt in space and head rest.
- A cushion with suitable pressure-relieving and postural support properties will also be required.
- Re assessment of an individual's definitive seating needs will need to be undertaken once the early rehabilitation has been completed.
- It is usually the role of the physiotherapist and nursing staff to undertake the first mobilisation.
- Typically an abdominal binder is applied to those without abdominal innervation, graduated pressure stockings and ephedrine is taken 30 minutes prior to mobilisation to aid orthostatic hypotension.
- The physiotherapist needs to ensure correct posture and adjust the wheelchair as required once the patient is hoisted into it.
- It is the responsibility of all attending staff to monitor the patient closely, especially for symptomatic signs of low blood pressure.
- Mobilising the individual who requires ventilator support offers additional challenges which must be managed safely. Often a third person is required to manage the tracheostomy, ventilator tubing and ventilator.
- First mobilisation may only last up to 20 minutes, with postural hypotension or concerns over skin condition being the limiting factor.
- If the patient complains of dizziness, the legs should be raised and the chair tipped backwards until the symptoms subside.

- The duration of mobilisation should gradually be increased over the following days or weeks until the patient is able to manage sufficiently long enough in the wheelchair to participate in active rehabilitation. During this period, the patient will also wean from the use of ephedrine.
- Subsequent mobilisations are usually undertaken by the nursing staff.

Skin management

- An appropriate pressure-relieving cushion must be provided for mobilisation and the skin on the ischial tuberosities, greater trochanters and sacrum in particular needs to be monitored closely, ideally, immediately on returning to bed.
- Patients need to be taught how to relieve pressure from the ischial tuberosities.
- The most common method is forward leaning.
- Side leaning can also be utilised, as can a vertical lift, although this is not recommended due to the increased pressure put on the shoulder complex.
- With each method the ischial tuberosities need to clear the cushion and the position must be held for 2 minutes (each side if side leaning) at least hourly.
- Patients with a high level of injury who are unable to safely use one of the techniques described can change the tilt of their chair to redistribute the pressure.
- Initially the patient will require assistance with pressure relief and require prompting from the nursing staff to carry this out.
- The patient should however progress to completing the task independently as soon as they are able. Verbal independence is imperative in those without the physical ability.
- Skin management must be carefully considered and monitored throughout rehabilitation during all activities and tasks, positioning and seating.

Psychological impact

- It is at this stage that the true impact of the individual's spinal cord injury often becomes apparent to them as they first become aware of an altered ability to balance.
- The response to this is highly variable and for some this stage poses a particular emotional challenge and presents particular problems to the staff.
- Involvement of a psychologist should be encouraged and sought with consent of the patient, whilst the team need to support the patient through this stage.

Rehabilitation following mobilisation

- Whenever physical independence in functional activities cannot be achieved, the physiotherapist must ensure that the patient has the knowledge to direct all necessary procedures and that the carers have been shown how to assist or carry out any handling

skills that may be required.

- It is essential that the rehabilitation process prepares the patient as far as is practically possible for the future lifestyle that they wish to pursue.
- This will necessitate regular goal planning, problem solving and close communication between all team members.
- Independence is not only related to physical competence, it is more to do with the ability of an individual to direct and control their life situation.
- Physiotherapy should utilise an individual's own coping skills to maximise their full potential, physical or otherwise.
- Risk assessment of each of the rehabilitation tasks is paramount and continuous, to ensure that the patient is progressed in a safe manner avoiding possible complications or injury.

Limitations

- The medical team may place certain limitations on the initial rehabilitation phase due to the stability or healing of the fracture site, associated injuries, infection or problems related to a disease process.
- These limitations may take the form of limiting specific activities, e.g. weight bearing through a fractured limb or through provision of a collar or a brace.
- Clarity about any limitations in place and for how long these apply will need to be sought prior to the early stages of rehabilitation.

Activities restricted by a collar

- Tetraplegic patients, who have had their fracture conservatively treated, will usually wear a collar until the neck is strong enough to control and hold the head adequately.
- The type and duration of collar used is at the discretion of the consultant.
- Some patients may have a soft collar, others may have a more restrictive one, e.g. a Philadelphia collar.
- Rehabilitation will be guided by the biomechanical restrictions of a collar.
- Any exercise where movement of the head plays an important part in achieving the activity cannot be completed and therefore should not be attempted, e.g. balancing on a plinth, lifting in long-sitting, rolling, unassisted lying to sitting and advanced wheelchair skills involving back wheel balance.
- Although the soft collar does not restrict rotation, this should not be encouraged initially.

Activities restricted by a brace

- A brace is intended to stop forward flexion and rotation of the trunk.
- A correctly fitted brace will automatically dictate which activities are restricted: i.e. activities which require leaning forward beyond vertical when long sitting, e.g. legs-up

transfer, lifting in long-sitting, and dressing on the bed.

- Activities which require flexion or rotation of the trunk itself will also be impossible to carry out, e.g. bath and floor transfers, balancing, rolling and advanced wheelchair skills involving back wheel balance.

Balance training

- Balance training is essential to enable the paralysed person to gain confidence in the sitting position and should be worked on in both long sitting (if able) and short sitting.
- This is achieved rapidly for lower lesions, but may require much perseverance in tetraplegia.
- Postural awareness using the visual feedback of a mirror is progressed to unsupported sitting or dynamic exercises or games.
- The patient must develop a good functional sense of balance before other functional tasks can be pursued.

Strengthening

- A strengthening programme should be based upon an accurate assessment of muscle strength and task analysis and should consider the importance of specificity of training to facilitate carry over to the task.
- It is also important to consider endurance, not just strength.
- There are a number of ways in which a muscle can be strengthened:
  - Assisted, gantry suspension or use of a mobile arm support for functional activities
  - Resisted exercises, e.g. using weights, pushing up a slope, squats, sit to stand, lifting
  - Aquatic therapy and swimming
  - Functional electrical stimulation (FES) and use of a FES bike
  - Speed and endurance training
  - EMG and bio feedback for very weak muscles.
- Strengthening of the neck muscles is particularly important for posture and function in those with a cervical or upper thoracic injury and should be introduced initially using isometric exercises, if still using a collar, following discussion with the consultant.
- Strengthening of the back extensors for those with a lower spinal cord injury is also of great importance and should be commenced during the rehabilitation phase.
- It is important to monitor the effects of strengthening, particularly resistance training, upon any identified spasticity and adjust accordingly.
- The patient must also be able to monitor closely their position whilst carrying out the programme to ensure the correct muscles are being trained and poor posture is avoided. This may require supervision.
- It is inevitable that many individuals will demonstrate muscle imbalance, but the effects on posture must be minimised and the appropriate stretches used to enable postural

maintenance.

- Individuals may develop shoulder pain, due to muscle imbalance and the long-term use of the joint as a weight-bearing joint.
- Exercises to strengthen the rotator cuff help prevent the development of long-term complications and should be instigated from an early stage.

Matwork

- Rolling, lying to sitting, moving across the bed and lifting form the basis of many bed-based functional activities such as dressing, positioning and getting in and out of bed and can also be considered as the building blocks for activities such as transfers and moving within the chair.
- These skills will generally be mastered in paraplegia, especially those with abdominal innervation, with greater ease and speed than those with tetraplegia.
- These tasks will often need to be broken down into smaller component parts until the whole task can be completed.
- The reader is referred to the recommended reading for further information and diagrams.

Transfers

- Not all patients will be able to transfer independently and those with lesions above C6 are unlikely to achieve the level of function to enable them to transfer independently.
- However, persons with a higher level of injury may be able to participate in a level transfer and will often be given the opportunity to explore this, even if for emergency purposes only.
- Transfers may be practised from an early stage in the rehabilitation process.
- Progress to independent transfers or those requiring the assistance of nursing staff, other members of the team or family occurs when deemed safe and appropriate.
- The use of various pieces of equipment such as sliding boards may be trialled during the development of the patient's ability to transfer and their suitability for long-term use assessed.
- The basic safety principles that cover any patient's ability to transfer are:
    - Castors should be positioned in a forward direction to improve the forward/backward stability of the chair
    - The patient should bring their bottom forward in the chair to avoid scraping the skin when transferring over the wheel, or other skin protection precautions should be taken
    - Avoid knocking or bumping the limbs
    - Vertical forces should be applied to the lift to avoid the chair moving sideways
    - Positioning the chair at an angle to the transfer surface helps to clear the wheel when lifting

    – The influence of spasticity should be considered and how this will interfere with the transfer.
- For lower tetraplegics and most paraplegics, physical independence can be progressed through the learning of advanced transfers.
- These require the ability to lift across significant height differences, e.g. bath transfers and on and off the floor.
- The ability to lift one's own wheelchair in/out of the car, back wheel balance, and negotiate kerbs and stairs are all taught if practical.

Bed transfers

- These are usually the first transfers that the patient will attempt and involve movement across equal heights.
- The patient may use legs down or legs up techniques dependent on their ability to maintain balance, the strength in their arms and trunk and their ability to move their legs either from the bed or from the chair.
- For full independence in this transfer the patient must also master the ability to place their legs on and off a bed independently.
- If the patient is unable to produce a strong lift then the chair may be placed at 90° to the bed to facilitate a forward lift.
- A variety of transfer boards are available and should be trialled with those who are unable to achieve sufficient lift, or demonstrate additional complications such as spasms.

Car transfers

- Car transfers are regarded as an advanced transfer and pose a number of challenges, e.g. negotiating the large gap between the car seat and the wheelchair and the confined space available for assistance or manoeuvring.
- They are, however, often taught relatively early in the rehabilitation process, where appropriate and safe, to enable the patient to commence visits out with family and friends and when applicable, weekend leave.
- Transfers therefore often start with teaching relevant family and friends how to assist the transfer into the passenger side of the car and then progress to independent transfers into the drivers' side if returning to driving is a possibility.
- Sliding boards can be used to provide the necessary assistance for those patients with a weaker ability to lift and the patient should be taught how to use the confines of the car to provide points of balance support, e.g. using existing hand holds, resting their head against the support of a seat or reclining the seat to facilitate positioning once in the car.
- The position of the legs for the transfer is dependent on personal preference and the presence of factors such as spasticity and therefore a variety of positions can be trialled.
- In most cases it is easier for the patient to place both the legs into the car or one leg in and one leg out before the transfer.

- Consideration needs to be given to the method the patient will employ to dismantle the wheelchair and lift it in and out of a car.
- This will need to be developed once the patient has gained sufficient confidence to transfer independently.
- The exact method of dismantling and placing the chair in the car will depend on the type of chair and may impact on the final wheelchair choice.

Toilet and shower seat transfers

- This transfer is dependent on the access to the toilet, the space available and the presence of any adaptations, i.e. hand rails.
- The use of a sliding board may be difficult in the space available and therefore this transfer may be problematic.
- The ability to move in the wheelchair towards the toilet before the transfer and a good strong lifting technique are required.
- Transfers can be practised at a variety of angles to the toilet, i.e. next to, at 90° and 180° with the aim to provide as many options for toileting as possible.
- The position of the feet needs to be trialled, but many opt for feet on the floor.
- Dressing pre- and post-toileting often occurs in the wheelchair due to the extra stability it provides and therefore the individual must be very careful not to knock or scrape their skin.
- Transferring through 180° from the chair to toilet seat may be a technique that can be learnt by the more able patient allowing a transfer to take place in more confined spaces.
- The transfer from wheelchair to toilet seat is similar to the process required when getting into and out of a shower, although in addition to the above, the patient must be aware of the need to ensure areas to be used for gripping are dry to avoid slips and falls.

Bath transfers

- In order to achieve a bath transfer the patient must be able to perform a good strong and controlled lift that allows them to raise their bottom higher than the supporting hands.
- The patient needs to practise lifting and tucking simultaneously, which involves the contraction of latissimus dorsi in long sitting to lift the pelvis.
- They will need to be made aware of the safety issues associated with transferring in a wet environment and the added risk of damage to the skin when transferring, due to it having been soaked for a prolonged period.
- To prevent pressure-related issues the patient should sit on a cushion when in the bath to avoid prolonged contact with the firm surface.

Floor transfers

- Floor to chair or a controlled chair to floor transfer is usually only achieved by paraplegics

and very low tetraplegics.

- It is used for many functional activities, e.g. to get back in the chair following a fall, to participate in activities on the floor and to enable stair climbing on their bottom.
- The ability to carry out this transfer is greatly affected by the range of motion and flexibility of the shoulders and lower limbs, body proportions, upper limb strength, balance and motivation.
- The task is initially broken down into component parts, decreasing the distance from the wheelchair using a stool.
- Once this has been mastered, progression towards the full distance can be made.
- To get onto the floor the patient needs to lift the head up and bring the body forwards, this is followed by controlled eccentric muscle action to lower the bottom to the floor.
- Lifting back onto the chair requires the patient to bring their head forward onto flexed knees enabling sufficient tuck to be able to pivot the bottom upwards towards the chair seat.
- Great care must be taken to ensure that the skin is not knocked on the way down or back up.
- The height of the transfer required can be reduced slightly by removing the cushion from the chair prior to the transfer; however, a method for replacing the cushion once in the wheelchair must also be taught.
- The type of transfer will be influenced to some degree by the type of wheelchair, i.e. rigid frame chairs promote sideways transfers and folding chairs lend themselves to forward or backward transfers.

Wheelchair mobility, skills and selection

- 'Wheelchair mobility is fundamental to the independence of people who are unable to walk' (Harvey 2008).
- It is therefore vitally important to maximise the ability through correct selection of the wheelchair and achievement of mobility and advanced skills where appropriate.
- It is important to commence wheelchair skills at a very early stage initially encompassing the basic activities of moving forwards, backwards, turning, slopes and teaching relatives safe pushing, up and down kerbs, how to fold, lift in and out of a car.
- For those with a higher level of injury a power wheelchair will usually be used for mobility using hand control (C4 and C5), head switches, chin control, mouth or breath control and recently the development of systems to use eye control.
- The choices available for manual wheelchair selection are vast and encompass tilt in space wheelchairs, manual wheelchair with power-assist wheels, rigid or folding frame wheelchairs.
- The appropriate selection is multifactorial and includes factors such as level of injury, completeness of injury, pain, spasticity, premorbid lifestyle, anticipated post injury lifestyle, wheelchair service provision, achievement of skills such as car transfers and potential for a return to driving.

- A range of chairs should be trialled where available and judged on comfort, ease of manoeuvrability, storage, use, ability to carry out activities of daily living, impact on transfers and independence i.e. ability to get wheelchair in and out of a car.
- A manual wheelchair will be required as a reserve, should a power chair fail.

Activities of daily living

- Activities of daily living such as dressing, feeding, drinking, grooming, typing, computer work and cooking tend to be activities that are commenced by the occupational therapist.
- They are dependent on co-ordination, the appropriate range of movement, balance and muscle strength and interaction and therefore close liaison and joint working between the occupational therapist and the physiotherapist is essential.
- The ability to achieve these activities is dependent on the level and completeness of injury and whilst those with a high level of injury may not be able to achieve these activities physically, they should be verbally independent in instructing these skills.
- Various types of splints, environmental controls, software and adaptations can be used to enable the individual to be as independent as possible.
- Information regarding return to work and driving should be provided when applicable.

Standing

- Standing is used in the early rehabilitative phase to help train the vasomotor system and manage orthostatic hypotension.
- Long-term standing following spinal cord injury has long been advocated two to three times a week for 60 minutes for the following reasons:
  - Aids bladder and bowel function
  - Joint and contracture management
  - Spasticity management
  - Balance training
  - Psychological well being
  - Bone density.
- However, the evidence to support the theory and practice is inconclusive.
- Many patients do enjoy the activity and continue to stand following discharge, generally using a tilt table if they have a high level of injury or a standing frame.
- There are a number of different types of frame commercially available for those requiring assistance to stand, e.g. 'Grandstand' or 'Easy Stand' to the more traditional Oswestry standing frames.

Gait training

- Ambulation can be taught to complete paraplegics and well-motivated low tetraplegics.
- However, it remains of functional benefit to only a few.
- Few physiotherapist working outside of a spinal unit will come across this method of gait training and ambulation.
- Further reading is available providing more information on this subject (Bromley 2006, Harvey 2008).

Cardiovascular fitness

- Increasing cardiac and ventilatory demand in a controlled manner is essential in SCI to minimise morbidity and mortality in the future (Harvey 2008).
- Guidelines established by the American College of Sports Medicine recommend those with SCI exercise for at least 20 minutes, three to five times a week at an intensity corresponding to 50–80% of maximum exercise capacity (Figoni 1997). This intensity is suggested by Franklin (1985) to be around 70–85% of maximal heart rate.
- The type of exercise undertaken depends on a patient's neurology, their interest and availability of space and equipment.
- At the National Spinal Injuries Centre we offer FES cycling, arm ergometry, the 'Rolling Road' (a treadmill for wheelchairs), functional timed wheelchair propulsion tasks, sports and circuits based on the model used for aerobics classes in any local gym.

Incomplete spinal cord injuries

- The incidence of incomplete SCI varies according to the literature and could be higher than suggested due to the many incomplete injuries that are not admitted to a spinal injuries unit from where the statistics are collated.

Incomplete syndromes

- It is important to remember that no two lesions and injuries are the same.
- The pathology of each lesion will be different due to the complex nature of the spinal cord.
- There are, however, certain types of lesions that are referred to as syndromes (Table 16.1).

Table 16.1 Incomplete spinal cord syndromes

Syndrome	Central cord syndrome	Brown–Séquard syndrome	Anterior cord syndrome
	Most common type of incomplete spinal cord injury (Shaw 1995)	Transverse hemisection of the spinal cord, whereby half the cord is damaged laterally (Sullivan 1989 cited by Edwards 2006)	Results from damage to the anterior part of the spinal cord
Cause	Usually affects older people who sustain injuries in falls or road traffic accidents and usually also present with cervical spondylosis	Lateral damage to one side of the cord sometimes caused by penetration injuries such as stab and gunshot wounds	Traumatic – forced flexion, compression injuries which may occur in diving or road traffic accidents (Foo et al 1981 cited by Edwards 2006) Non-traumatic – herniated intravertebral disc, infarction secondary to anterior spinal artery thrombosis or rupture of aortic aneurysm
Clinical presentation	Bilateral loss of pain temperature, light touch and pressure with varying degrees UL's disproportionately more affected more than LL's Flaccid paralysis at level of lesion due to disruption of the anterior horn cell Recovery tends to be LL's, bladder/bowels, UL and hands (Roth et al 1990)	Motor loss occurs on the same side due to destruction of the corticospinal tracts Flaccid paralysis at the level of the lesion due to damage of the anterior horn cell Loss of pain and temperature on the opposite side to the lesion due to destruction of the spinothalamic tracts Loss of position sense, vibration and tactile discrimination on the same side as the lesion	Motor loss Loss of pain and temperature sensation Preservation of tactile and proprioception due to intact dorsal columns
Functional outcome (Burns and Ditunno 2001)	57–86% ambulate independently 97% under 50 years 41% over 50 years	Almost all will ambulate successfully	Poor motor recovery

Functional outcomes

- Functional outcome is difficult to predict and is dependent on many factors including age, type of injury, length of time since injury and pre-morbid status.
- Waters et al (1995) suggested that the majority will walk with or without aids and 76% of incomplete paraplegics will be community ambulators.

Physiotherapeutic management

- The management of the incomplete spinal cord injured patient differs significantly from that of the patient with a complete lesion.
- As with most patients undergoing rehabilitation for a neurological condition, the ultimate goal is normal movement.
- Often this is not achievable and compensations and orthoses are required to achieve the final goal.
- It is important to recognise the need for early intervention to be directed towards minimising the secondary effects of spinal cord injury.
- Patients who do not demonstrate complete cord transection on scan and therefore have the chance of some sparing should be treated, at least initially, as an incomplete injury.
- There are many ways to achieve the final goal, the above principles should be considered throughout the acute and rehabilitation period (Box 16.1).

Box 16.1 Principles to be followed during rehabilitation of a patient with a SCI

- Minimise secondary effects

- Loss of body schema
    - Altered muscle tone and movement dysfunction
    - Weakness
    - Muscle imbalance
- Prevent length-associated changes in musculoskeletal system
    - Shortening/lengthening
    - Change in phenotype and muscle characteristics
    - Alteration of mechanical resistance
- 'Restoration' of normal movement
- Promotion of plasticity through the creation of an enriched environment
- Careful consideration of the development of compensatory movements and use of external devices/orthoses
- Consider the impact of pain, fatigue and psychological factors

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The high cervical lesion (C4 and above)

- For many, the rehabilitation of an individual with a high cervical lesion can be challenging.
- Physical independence in many activities of daily living and care may be unachievable. The patient needs to be able to communicate their wishes and describe all the aspects of their care from ventilator settings, need for suction, correct positioning in the bed or chair, to bladder, bowel and skin care.
- Developing the ability to instruct carers is an essential part of regaining control over their life.
- Throughout rehabilitation physiotherapy management is directed at:
    - Maintaining and maximising respiratory function
    - Teaching breathing using accessory muscles to enable the person to manage for very short periods should the ventilator become disconnected, e.g. during transfers
    - Establishing means of communication
    - Identifying postural and seating needs in the wheelchair and bed
    - Identification of equipment, e.g. powered chair
    - Strengthening of innervated muscles and minimising effects of muscle imbalance
    - Establishing independent neck range and strength
    - Reducing and managing spasticity
    - Maintenance of joint range for hygiene, care-related activities and body image
    - Education of patient, family and carers.
- A patient with a high SCI should be given the opportunity to explore possible leisure opportunities and sports.
- Using equipment, knowledge and assistance a ventilated person with a complete C3 injury can achieve assisted skiing, whilst a patient with a C2 injury can learn to paint using mouthsticks.

- The duration of admission for patients with this level of injury is often longer to enable them to be discharged safely to the appropriate environment with the appropriate equipment, education and level of care.
- An example of a complex patient pathway for a high cervical lesion is included in Appendix 16.1.

Sport

- Sport has long been recognised as being important in the rehabilitation and re-integration of patients with spinal cord injury.
- Therapeutically it assists balance retraining, co-ordination, strength, wheelchair skills and endurance.
- It can be particularly beneficial to the self confidence of those who enjoyed sport pre-injury and also to those introduced to sport in a wheelchair for the first time.
- Sport provides a challenge or focus away from the formal rehabilitative process and can be enjoyed by individuals of all spinal injury levels ranging from Boccia and blow darts for very high lesions to swimming, table tennis and wheelchair basketball for the lower lesions.
- Activities such as scuba diving, sailing and skiing can be trialled following discharge.

Community re-integration and discharge

- Returning to the community, for the first time is a challenging time for the person with SCI.
- The security of the hospital environment with availability of health care professionals to manage concerns and the familiarity of other wheelchair users is replaced by a world where disability and the needs of a wheelchair user may be unfamiliar.
- Anxieties in relation to home and family life, relationships, access, employment, care provision, finance, attitudes and isolation are all real threats.
- The patient should be prepared for the transition from the hospital to the community as a continuation of their rehabilitation goals.
- Review of access in the home environment, frequent community visits, continued social networking, links with local peer groups and community services, awareness and preparation of social support systems, and provision of written material and information may all be of benefit (Whalley Hammell 1995).

Ageing with spinal cord injury

- Medical advances preventing complications, such as renal failure, have influenced the

survival prognosis of individuals with a SCI.

- The challenges associated with ageing are now becoming more evident requiring different approaches to be developed through research.
- It is important that these patients are supported by professionals who can recognise and understand age-related changes, implementing strategies that include use of adaptive equipment, review of functional techniques, environment and care input to prevent deterioration and to promote independence.
- McColl et al (2002) list five changes that patients with SCI undergo with ageing:
  - The long-term effects, e.g. shoulder pain, chronic bladder infections
  - Secondary health conditions of the original lesion, e.g. post-traumatic syringomyelia
  - Other pathologies, e.g. cancer
  - Degenerative changes, e.g. joint problems
  - Environmental factors, e.g. societal, cultural, that may potentially complicate the experience of aging with a SCI.
- These factors have potential to compromise the ability of someone with a SCI to remain independent and be able to participate in their communities in later life.

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Chapter 16

E-materials

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Author profiles

Scott Hawthorne

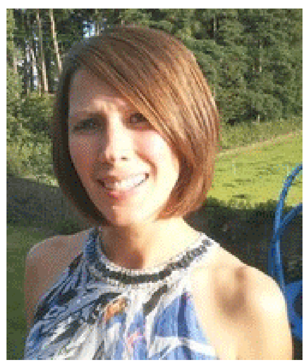
Scott graduated from Sydney University at the end of 1998, believing sports physiotherapy was the only area of interest. However, following exposure to acute spinal cord injuries as a new graduate at Royal North Shore Hospital in Sydney, he chose to continue in this field as a rehabilitation physiotherapist at Moorong Spinal Unit, Royal Rehabilitation Centre Sydney from the year 2000. Under the guidance of Lisa Harvey, a highly published PhD in the field of spinal injuries, he established a firm knowledge base in the speciality.

As is common with many an Australian physiotherapist, the lure of travel brought him to the UK in 2002 and exposed him to a variety of fields as a locum physiotherapist. He eventually returned to his earlier acute practice in 2004 at North Middlesex Hospital for 2 years as the physiotherapy lead in acute medicine for the older person.

His long-held desire to work at the National Spinal Injuries Unit at Stoke Mandeville Hospital came to fruition in 2004, whereby he has since continued to work as a specialist physiotherapist in acute spinal cord injuries. He developed a passion for teaching, and has been the principal lecturer for the acute component of the spinal injury course 'Bridging the Gap' and yearly presents as a 'visiting lecturer' at the University of Bedfordshire, School of Nursing.

Joanna Camp BSc(Hons) MCSP

Jo has specialised in Neurological Physiotherapy for 13 years, and has been working at the National Spinal Injuries Centre, Stoke Mandeville as a Highly Specialist Physiotherapist since 2001. A keen educator, she currently runs a 'Splinting in Neurology' course and lectures on Physiotherapy management of adults with spinal cord injury. She has a specialist interest in the rehabilitation of persons with incomplete Spinal Cord Injury.



Appendix 16.1 Spinal cord injury centres in the united kingdom and eire

Belfast Spinal Cord Injuries Unit

Musgrave Park Hospital
Stockman's Lane
Balmoral, Belfast BT9 7JB
Tel: 028 9066 9501

The International Spinal Injuries & Rehabilitation Centre

Royal Buckinghamshire Hospital
Buckingham Road, Aylesbury
HP19 3AB
Tel: 01296 330 575

National Medical Rehabilitation Centre

Rochestown Avenue, Dun Laoghaire
Dublin
Eire SB 30
Tel: 00-353-12854-777

Queen Elizabeth Spinal Injuries Unit

Southern General Hospital
1345 Govan Road, Glasgow
G51 4TF
Tel: 0141 201255

Golden Jubilee Spinal Injuries Centre

James Cook University Hospital
Marton Road, Middlesbrough
TS4 3BW
Tel: 01642 85085

The Midland Centre for Spinal Injuries

The Robert Jones & Agnes Hunt Orthopaedic Hospital
Oswestry, Shropshire
SY10 7AG
Tel: 01691 404655

Rookwood Spinal Injuries Rehabilitation

Unit

Rookwood Hospital
Fairwater Road, Llandaff
Cardiff
CF5 2YN
Tel: 029 2041 5415

The Duke of Cornwall Spinal Treatment Centre

Salisbury District Hospital
Odstock Road, Salisbury
SP2 8BJ
Tel: 01722 336 262

Princess Royal Spinal Injuries Unit

Northern General Hospital
Osborne Building, Herries Road
Sheffield
S5 7AU
Tel: 0114 2715644

Southport Regional Spinal Injuries Centre

Southport and Formby General Hospital
Town Lane, Southport
PR8 6NJ
Tel: 01704 547471

The London Spinal Injuries Unit

Royal National Orthopaedic Hospital
Brockley Hill, Stanmore
HA7 4LP
Tel: 020 8954 2300

National Spinal Injuries Centre

Stoke Mandeville Hospital
Mandeville Road, Aylesbury
HP21 8AL
Tel: 01296 315 000

Yorkshire Regional Spinal Unit

Pinderfields General Hospital
Aberford Road, Wakefield
WF1 4DG
Tel: 01924 201 688

Appendix 16.2 Spinal innervation of the muscles of respiration

Muscle(s)	**Innervation**
Platysma	7th cranial nerve (facial)
Sternocleidomastoid	11th cranial nerve (accessory)
Trapezii	11th cranial nerve (accessory)
Diaphragm	C3–5
Scalenes	C3–8
Pectorals	C5–T1
Intercostals	T1–11
Abdominals	T6–12

Appendix 16.3 Resources

Segmental level	Personal independence	Wheelchair management	Transfers	Gait
C4	Type, turn pages, use telephone and computer with mouthstick			
C5	Type Feed	Manipulate brake Push on the flat		
C6	Drink Wash, shave, brush hair Dress upper half Sit up/lie down in bed Write	Remove armrests/ footplates Push on sloping ground Turn chair	Chair ↔ bed Chair ↔ car ?with sliding board	
C7	Turn in bed Dress lower half Skin care	Pick up objects from floor Wheel over uneven ground 'Bounce' over small elevations	Chair ↔ toilet Chair ↔ chair ?Chair ↔ bath	Stand in frame

Appendix 16.4 Resources in the public domain

- http://www.physiotherapyexercises.com

Free spinal injury exercises, for producing guidance sheets for patients, similar to 'PhysioTools'. Also shows video footage of a number of functional tasks performed by wheelchair users, e.g. floor to chair transfer

- http://www.pva.org/site/PageServer?pagename=pubs_main

Thoroughly researched and referenced guidelines to clinical practice for clinicians of all levels of experience in spinal injury. Consumer manuals for patients and family are also available for free download

- http://www.scireproject.com

The spinal injury version of the 'Cochrane Collaboration' producing systematic reviews covering many aspects of spinal injury care

- http://www.spinalcord.uab.edu

A spinal injury information network, listing a number of topics, linking the user to external related educational websites

- http://www.spinalcordcenter.org/consumer/manual.html

Educational manuals aimed at patients and their families covering a wide range of spinal injury topics. Also useful to therapy students new to the field

Case Study 16.1 Cervical C4 complete spinal cord injury (AIS A)

- 21-year-old male, labourer.
- RTA, the car he was a passenger in, hit a wall and rolled at 60 mph.
  - Complex fracture and anterior dislocation of C4.
  - Pedicle and lamina fractures of L2 and L3.

Initial assessment

- On admission to the SIU the following observations were recorded:
  - vital capacity was 1.16 litres
  - oxygen saturations were 94% with the patient self ventilating on room air, increasing to 97% when using the incentive spirometer
  - cough was very weak and dry, whether supported or not
  - auscultation was quiet throughout
  - initial CXR and ABGs were normal
  - there was full upper limb range (shoulder extension not tested due to turning bed) and no limitations were seen in the lower limbs within the allowable 30 degrees hip flexion (due to unstable L2/3 fractures)
  - no power or sensation seen below C4
  - all four limbs were flaccid
  - the patient complained of sharp pain in the neck 9/10 over C4.

Acute/bedrest management and early rehabilitation

- On Day 1, IPPB was refused, so incentive spirometry was commenced instead, with reluctant compliance.
- Full passive upper limb ranging was performed, as was the case with lower limbs, limiting

hip flexion to 30 degrees and using ‘frogging (half tailor position)’ to achieve full knee flexion range.

- The therapist liaised with the medical team regarding analgesia for neck pain and a positioning programme commenced for the upper limbs, using the ‘half crucifix’ position with the assistance of arm boards on one side and distal elevation of the contralateral upper limb by the patient’s side using a ‘ski-jump’ pillow.
- Occupational therapists assessed the patient for resting hand splints.
- NIV BiPAP via a facemask was commenced at the first sign of respiratory distress and elevated $PaCO_2$.
- As cognitive function started to improve, habitual posturing of the shoulders in elevation was noticed, resulting in pain on passive shoulder flexion at 160° and palpation of bilateral upper trapezius muscles 8/10.
- The patient required intubation, due to minimal spontaneous respiratory effort. Chest physiotherapy included side to side turning using the turning bed mechanics, manual hyperinflation (MHI) with periodic inspiratory holds, adding bagged in nebulised mucolytics (e.g. Parvolex™) as secretions became thicker, expiratory shakes and closed circuit suction performed in time with manual assisted coughs.
- Regular assessment for respiratory activation was performed throughout whilst the patient was on the manual hyperinflation bag or IPPB.
- Upon return of function, vital capacity was recorded via the tracheostomy (Wright™ respirometer Mark 8) at 50 mL.
- As the routine became established, IPPB delivered via the tracheostomy replaced MHI to free up the therapist’s hands and to allow for spontaneous breath attempts.
- Positioning of the limbs and passive ranging continued as it had on the ward.
- When episodes of asystole began to present, each therapy session was preceded by prophylactic IV glycopyrrolate and 100% oxygen delivered through the ventilator 2 minutes prior to commencing treatment.
- A nurse was on standby with atropine should the heart rate drop and remain below 40 beats per minute.
- This ceased once the pericardial effusion was drained and no further bradycardic episodes were observed.
- Full range lower limb stretching was performed post lumbar surgery, including hip flexor stretches whilst the patient was turned to the side for washing.
- Neck stretches and active assisted neck range of motion exercises commenced post removal of the collar after the consultant’s permission was obtained.
- The Cough Assist™ machine was introduced upon returning to the ward and delivered by the nursing staff via the tracheostomy, twice daily post bronchodilator nebuliser to encourage regular secretion clearance.
- The father was taught this, along with tracheal suctioning by the senior physiotherapist, to maintain secretion clearance and also to assist the father’s parental desire to help his son in a practical fashion.
- Distal limb joint ranging was also taught to the father for this reason.

- Soft tissue massage of upper trapezius muscles, caudal and lateral scapulae glides and regular repositioning of the shoulders into depression was used to assist with shoulder pain.
- Heat and acupuncture were considered, but avoided due to inability of the patient to monitor response to the intervention.
- Following the report of loss of dorsiflexion range, bilateral UFOs (Universal Foot Orthoses) were utilised, slowly increasing the time period of application to monitor effects on the skin.
- Customised soft/scotch casts were avoided due to the varying limb circumference evident post spinal injury.
- As spontaneous respiratory efforts recommenced, IPPB was utilised with a gradual increase of the trigger (lower sensitivity) as improvements occurred.
- This functioned as 'biofeedback' for a neurological system undergoing plasticity.
- Progression came with the use of a low vital capacity incentive spirometer (e.g. Cliniflo™) via the tracheostomy with entrained supplemental oxygen.
- Upon permission to mobilise out of bed, preparations were made by sourcing a suitable tilt-in-space wheelchair and cushion and sitting up in bed with an abdominal binder in situ using the inbuilt bed mechanics.
- The father was taught the bed controls and together they progressed subjective tolerance of the upright position in bed.

Re-assessment post-mobilisation

- A repeat formalised neurological check identified a new diagnosis of C2 AIS A tetraplegia with a zone of partial preservation between C3–4.
- Repeat muscle chart showed bilateral grade 4 shoulder elevation and grade 2 scapulae retraction. All other muscles were absent. Sensation was normal to the C2 key point, impaired to C4 and absent below.
- Shoulders achieved full range flexion, but with pain above 160 degrees. Ankle dorsiflexion was limited to 10° past plantargrade. Pain at 6/10 remained on palpation of upper trapezius muscles. Moderate cervical dystonia was evident, restricting all ranges to half of predicted. The trunk also had minimal range throughout. Upper limb extensor tone was graded as '2' on the Modified Ashworth Scale.
- Vital capacity remained at 50 mL, CXR and auscultation was clear and a moderate dry cough was generated with assistance. He remained on volume control ventilation via cuffless tracheostomy and achieved half a second of disc elevation during incentive spirometry set at a resistance of 100 mL/s.
- A repeat cervical MRI showed myelomalacia between C3–5.
- In addition to the initial assessment the following points were identified during the early rehabilitation process:
  - Pressure mapping during seating clinic showed even distribution of pressure whilst on a Roho cushion only

– Neuropsychology assessment demonstrated reduced executive function, behavioural/disinhibition issues and an improving short-term memory
– An occupational therapy access visit concluded his current residence was inaccessible and unable to be modified. Recommendations were made
– Dependent on assistance for all mobility and activities of daily living.

Management post-mobilisation

- IPPB use decreased, replaced by increased frequency of incentive spirometry use and a formal weaning programme.
- The long-term goal was to wean completely off ventilator use both day and night.
- Use of the Trainair™ began for enhancing respiratory muscle control.
- Prophylactic Cough Assist use continued twice daily throughout the remainder of his stay, delivered by nurses first, then carers.
- Joint and muscle length management involved regular passive limb and neck stretching, Maitland's mobilisation techniques for both the glenohumeral and scapulothoracic joints, trigger point needling of the upper trapezius muscles (as cognition improved) and trunk stretches over a roll during plinth work.
- He used a passive leg bike regularly and stood with the assistance of a tilt table every other day.
- A thoracic corset was manufactured by the Orthotics department to assist trunk alignment in sitting, but compliance was poor throughout and the approach was discontinued.
- A 24-hour positioning programme was established in collaboration with Occupational Therapy and nursing for both seated and recumbent postures – pictures with simple instructions were placed above his bed (with his permission) and in the medical notes to enhance continuity between changes in nursing shifts.
- Eventually the patient became verbally independent in instructing appropriate alignment.
- Strengthening of the available upper limb muscles was facilitated using sling suspension, with as much focus on 'active relaxation' as on contraction.
- Functional electrical stimulation (FES) was trialled on a variety of other upper limb muscles with no effect.
- Neck strengthening involved both power (springs as resistance whilst supine under a gantry) and endurance (tolerance of mouth stick activities) training.
- Regular active neck ranging outside of gym sessions was encouraged.
- Aquatic Physiotherapy was utilised twice weekly for a period, to assist limb and trunk mobility as well as to provide another medium for the patient to attempt to activate muscles he was unable to before. This last component did not assist in his case.
- Seating assessment and trials of a variety of chairs, cushions and backrests occurred with the assistance of pressure mapping.
- Recommendations to his local wheelchair service were forwarded and final set up

occurred upon delivery.

- He was taught to be verbally independent in instructing wheelchair set up prior to transfer, alignment post transfer and requesting assistance with pressure relief hourly to prevent skin deterioration.
- Goal planning commenced with the multidisciplinary team, initially focusing on short-term goals with the assistance of his father, progressing to discharge planning with decision making resting more with the patient.
- Multidisciplinary involvement included:
  - Medical staff titrating analgesia and antispasmodics
  - Nursing teaching verbal independence in bladder, bowel and skin management. Education was given to assist the return to sexual activity
  - Occupational therapists assisting access to computers via voice control, mouth-stick functional activities, independent mobility via a chin-controlled powered wheelchair and encouraging verbal independence in washing, dressing and domestic activities. They conducted community reintegration visits into the local town centre
  - Speech and language therapy working to enhance his ongoing dysarthria. Swallowing was not an issue
  - Psychology continued to focus on cognitive, behavioural and emotional issues. Counselling was provided to his father and regular liaison occurred with the treating team to enhance outcome during sessions without being hindered by challenging behaviour
  - Case management assisting provision of a discharge destination and a care package.
- Upon identification of named carers for his discharge destination, each member of the team conducted teaching sessions and provided individualised literature to support maintenance and progression of rehabilitation goals.
- Physiotherapy teaching focussed on respiratory and limb maintenance and direct liaison with the local physiotherapist who would be taking over his management post discharge.

Outcome

- Formal neurological testing at discharge resulted in a classification of C3/4 AIS A.
- Discharged to a neurological care home close to his family with in-house physiotherapy. This was to be an interim whilst awaiting re-housing options from his local authority.
- Verbally independent in all activities of daily living, personal care and transfers.
- Self ventilating 24 hours/day with a vital capacity of 1500 mL. The tracheostomy remained for suction access, with a 'red dot' in situ during waking hours.
- His own Cough Assist machine was provided, and continued to be used twice daily under his guidance.
- Daily maintenance stretches were provided by carers, with nocturnal use of hand splints.
- Negligible pain and joint range loss was evident at discharge. He continued to use the tilt table twice weekly in the attached physiotherapy gym.

- He was independently mobile in his own chin-controlled wheelchair, with a manual tilt-in-space wheelchair provided as 'back up'.
- He was independent and regular in his use of the computer both by voice and mouth-stick control.
- He developed an interest in painting via a mouth-stick and joined the local branch of the Mouth and Foot Painting Artists.
- He had regular supervised outings into his local neighbourhood, with his favourite being monthly outings to motocross events with his father.
- He was yet to express an interest in returning to work, but relevant literature and information about agencies that help were provided.

Summary statement

- This case reveals the need for a physiotherapist to demonstrate a wide range of their therapeutic skills.
- It also shows that even in a specialist institution, management is not always optimum (e.g. use of temporary pacing or loss of dorsiflexion range as therapists were more focussed on respiratory care).
- It shows how quickly a patient can deteriorate and how volatile their body systems are thereafter.
- However, it also shows the potential to recover and that an acceptable outcome can be reached in an otherwise undesirable presentation.
- From Day 2, ABGs showed a $PaCO_2$ of 7.2 kPa prior to commencing BiPAP.
- CXR showed bibasal collapse secondary to poor inflation.
- Over the coming weeks, vital capacity dropped to zero, $PaCO_2$ remained around 7.2 kPa despite invasive ventilation, temperature remained high at 39.7°C, CXR showed left-sided lung collapse.
- Copious thick dark yellow secretions were sent for analysis and grew *Staphylococcus aureus*.
- From the third month, the CXR became clear, ABGs remained within normal levels and secretions became less copious and thick. Limited right hip flexion to 110° with a spongy end feel was attributed to heterotrophic ossification and it was noticed ankle dorsiflexion was limited to plantargrade.

Case Study 16.2 C4 Complete spinal cord injury (AIS A)

Background

- 21-year-old male, labourer.
- Previously fit and healthy.
- Weekend drinker, smokes 10 cigarettes per day since age 14. Periodic cannabis use.
- Lives with father and 3 younger brothers.
- Past medical history – hay fever; previously attended anger management classes.

History of spinal cord injury

Day 1

- RTA, car hit a wall and rolled at 60 mph.
- Initial loss of consciousness for 1 minute.
- Upon waking he complained of neck pain and unable to feel or move any limbs.
- Admitted to local hospital.
- Plain film X-rays showed
  - Complex fracture and anterior dislocation of C4
  - Pedicle and lamina fractures of L2 & L3.
- Managed with hard collar and analgesia.

Day 2

- Transferred to Spinal Injuries Unit (SIU), treated by cervical traction and head blocks, on a turning bed.
- He developed Type II respiratory failure and was placed on NIV BiPAP via a facemask.
- He became agitated and sedation was increased to protect the spine.

Day 3

- Surgery, C4 posterior decompression and reduction, C4 corporectomy, C3–5 anterior and posterior fusion.
- On ITU postoperation with hard collar (for 6 weeks) and to stay on the turning bed (until lumbar surgery).
- Minimal respiratory effort postanalgesia, so remained intubated and ventilated via an endotracheal tube (ETT).
- Surgeons requested tracheostomy be delayed for 1 week to avoid infection to cervical metalwork.

Day 6

- No spontaneous breaths, rapid desaturation to 70%, secondary to a sputum plug, resulting in a cardiac arrest and asystole for 1 minute.
- On-call physiotherapy requested.

Week 2

- Asystolic events continued, up to 5 times a day, precipitated by turns, washing and physiotherapy.
- A temporary pacemaker was inserted to minimise the ensuing asystolic episodes following tracheal stimulation.
- At this stage chest physiotherapy was being given four times per day to manage thickened secretions.

Week 3

- L1–4 posterior fusion was performed.
- Occasional spontaneous breaths were noted, continuing agitation required ongoing sedation.

Week 4

- Switched to a Breas™ (mobile) ventilator via a tracheostomy to facilitate transfer to the ward.
- Temporary pacemaker removed.
- There was sudden onset of acute renal and liver failure which required haemofiltration and he remained in ITU.
- Septic shock followed the next day, leaving the patient unresponsive, left eye bloodshot and pupil dilated.
- Occasional spontaneous breaths ceased.
- Thick secretions continued.

Week 5

- Bouts of asystole returned, he showed signs of multiorgan failure and pulmonary oedema was noted during suctioning.
- A CT scan of his brain ruled out any causes in the brain, the neurologist diagnosed 'renogenic encephalopathy'.
- Thick secretions continued to require chest treatment.

Week 6

- Further investigations (MRI brain and electroencephalography (EEG)) were normal, although a CXR showed an enlarged heart, with further investigation by echocardiogram a pericardial effusion was detected (believed to be due to pacing wire removal).
- A pericardial drain removed 800 mL of fluid.

Week 7

- No asystolic events noted.
- Thick secretions continued to require treatment.

Week 8

- Returned to acute spinal ward, with secretions less thick.

Week 12

- Began nodding to questions appropriately.
- Limited R hip flexion was noted, X-ray confirmed heterotrophic ossification.
- The tracheal cuff was deflated, allowing return of voice.
- Oral feeding commenced under guidance of the speech and language therapist.
- Tracheostomy was changed to a 'cuffless' version.

Week 13

- Mobilised into a wheelchair.

Week 15

- Began attending physiotherapy gym.
- Spontaneous respiratory effort achieved using intermittent positive pressure breathing (IPPB).

Week 20

- Formal respiratory weaning programme commenced, with no further use of the ventilator required day or night 12 weeks later (week 32).

Week 46

- Discharged to a neurological care home with an ongoing physiotherapy programme.

Summary

This case highlights the dramatic and almost catastrophic events that may accompany a SCI. The reader should appreciate how a patient may make an excellent recovery from the cardiorespiratory, neurological and multisystem complications that can occur with very little warning alongside the presenting spinal cord signs and symptoms at any time during the

rehabilitation process.

Case Study 16.3 T6 Complete spinal cord injury (AIS A)

Background

- 36-year-old male.
- Self-employed mechanic.
- Living with partner.
- Previously fit and healthy.
- No significant past medical history.

History of spinal cord injury

- Fall over handlebars of a motocross bike during a race.
- Initial loss of consciousness and unable to move legs.
- Admitted to local hospital where underwent MRI which showed:
  - complex fracture of T6 extending through vertebral body
  - narrowing of spinal canal at T6
  - fracture T7
  - large paraspinal haematoma.
- Initially managed conservatively on bedrest.
- Transferred to Spinal Injuries Unit (SIU) 2 days post injury where he underwent surgical fixation T5–T8 with screws and bone grafting and decompressive laminectomy at T6, 4 days post injury.
- First mobilisation in wheelchair 9 days post injury.
- Commenced attending physiotherapy gym and active rehabilitation 6 days after first mobilisation.
- Discharged home 4 months post injury.

Assessment

- Initial transient type II respiratory failure secondary to analgesia.
- Reduced vital capacity (2.65 L) and strength of cough.
- Full passive range of motion in both shoulder girdles.
- Pain at fracture site and left shoulder.
- No active movement or sensation below T6.

Acute/bedrest management and early rehabilitation

- Respiratory management:
  - Use of intermittent positive pressure breathing (IPPB) for type II respiratory failure, incentive spirometry, assisted cough when required.
- 24-hour positioning regime including, positioning into frog position and ankles being positioned in neutral using pillows for support.
- Daily passive movements for lower limbs.
- Active movements for upper limbs including strengthening exercises.

Active rehabilitation

- During this period the patient commenced attending the gym, spinal cord injury education sessions and multidisciplinary goal planning.
- Long-term and short-term goals were identified and broken down into component parts, working towards independent wheeled mobility, independent transfers including car and wheelchair into car, knowledge of all aspects of spinal cord injury, independent management of skin, bladder and bowels, independent activities of daily living.
- A specific goal was set by the patient which was to achieve floor to chair transfers so he was able to propose to his girlfriend whilst on one knee.
- Employment, driving and leisure activities were discussed and information re: access to work, inclusive fitness initiative and driving assessment was given.
- Psychological support and family counselling provided by psychologists.

Assessment

- In addition to the initial assessment the following points were identified during the rehabilitation process:
  - Generalised pain around posterior aspect of the left shoulder and pain following the orientation of the biceps
  - Decreased left upper limb strength with muscle wasting secondary to suprascapular nerve damage, infraspinatus = grade1 and supraspinatus = grade 2
  - Decreased active external rotation left shoulder
  - Altered alignment of shoulder girdle into abduction during functional tasks
  - Altered glenohumeral rhythm and reduced scapula stability
  - Dependent on assistance for all mobility and activities of daily living
  - Development of para-articular ossification, therefore at risk of decreased hip range of movement
  - Development of neuropathic pain in buttocks requiring analgesia.

Management

- Matwork activities commencing with balance and lifting in long and short sitting, rolling and lying to sitting.
- Transfer practice starting with level transfers using a sliding board and assistance of 1, progressing to independent level transfers and advanced transfers including, toilet, shower seat, bath, car and bumming up and down stairs.
- Standing using tilt table progressing to Oswestry standing frame (OSF) for stretching, weight bearing and circulatory management.
- Upper limb strengthening including rotator cuff using weights, Thera-Band and traditional exercise equipment.
- Wheelchair skills pushing on level, up slopes, over uneven ground, backwheel balance, up/down kerbs and transferring wheelchair in/out car in driver's seat.
- Trial and selection of appropriate wheelchair and pressure-relieving cushion.
- Cardiovascular fitness activities, sport, hydrotherapy.
- Specific strengthening of infraspinatus and supraspinatus muscles through therapy facilitation, sling suspension, Thera-Band exercises, FES, functional exercises with and without FES to maintain alignment (e.g. feeding, drinking), scapular stability exercises and serratus anterior strengthening.
- Independent stretching and exercise programme for upper limbs and lower limbs.
- Trial and self-funded purchase of FES bike for cardiovascular fitness.
- Commenced regular weekend leave trips 2 months after injury.

Outcome

- Discharged home with appropriate wheelchair and cushion.
- Independent in all activities of daily living and transfers.
- Able to manage skin, bladder (via suprapubic catheter) and bowel independently.
- Returned to work and driving.
- Proposed to girlfriend (who said yes!) on one knee, but required minimal assist for transfer back into wheelchair.
- Provision of upper limb stretching and strengthening programme and lower limb stretching programme.
- Reduced activity, altered alignment and active range of motion into external rotation of upper limb and shoulder girdle (L).
- Referred for local outpatient musculoskeletal physiotherapy for suprascapular nerve damage management.
- Attending motocross meetings and returned to leisure activities.
- Able to attend local swimming pool and gym.

Case Study 16.4 C3 Incomplete spinal cord injury (AIS D)

Background

- 51-year-old male.
- Self-employed electrician.
- Married with 2 children living at home.
- Previously fit and healthy.
- No significant past medical history.

History of spinal cord Injury

- Fall over handlebars of a mountain bike into a stream.
- Found by wife, initially unconscious and unable to move arms and legs.
- Admitted to local hospital where spinal cord contusion of C3–5, but no bony injury was identified.
- Managed conservatively using hard collar and bedrest.
- Transferred to Spinal Injuries Unit (SIU) 10 days post injury where he was managed conservatively for total of 6 weeks on a turning bed, using head blocks for immobilisation.
- Diagnosed with central cord syndrome.
- First mobilisation in wheelchair wearing a hard collar 6 weeks post admission to the SIU.
- Commenced attending physiotherapy gym and active rehabilitation 1 week later.
- Discharged home after 6 months.

Assessment

- Reduced vital capacity and strength of cough.
- Reduced range of motion in both shoulder girdles (L>R) specifically into flexion and lateral rotation.
- Altered alignment of shoulder girdle and upper limb into elevation and protraction of scapulae, internal rotation, abduction and extension of glenohumeral joint with elbow flexion with shortening of pectoralis minor.
- Neurogenic and nociceptive pain in both shoulders.
- Altered movement pattern of shoulder girdle with initiation from levator scapulae and upper trapezius.
- Reduced activity and selectivity of hand movement (L>R).
- Altered sensation and proprioception of shoulder girdle, upper limbs, hands and lower

limbs.

- Weakness and decreased activation of lower trapezius, serratus anterior, triceps, rhomboids.
- Decreased activation of abdominals during upper limb activities or lower limb activities.
- Unable to gain selective head, neck or trunk movement, decreased visual field and deconditioning due to immobilisation.
- Reduced activity and selectivity of lower limbs.
- Anxiety and fear.

Acute/bedrest management and early rehabilitation

- Respiratory management:
  - Use of intermittent positive pressure breathing (IPPB) prophylactically, incentive spirometry, assisted cough when required.
- 24-hour positioning regime including: positioning into unilateral and bilateral crucifix of upper limbs alternating with upper limb abduction and lateral rotation, frog position and ankles being positioned in neutral using pillows for support.
- Daily passive movements for upper limbs and lower limbs progressing to active assisted when possible.
- Sensory stimulation of scapulae, upper limbs, hands and lower limbs through therapist and autostimulation, i.e. stroking and touching joints of upper limbs, tapping and rubbing hands together (with assistance), touching face, hair, etc. to provide afferent stimulation of cutaneous and joint receptors to improve/maintain body schema.
- Soft tissue mobilisation to gain appropriate length of tight/malaligned structures around scapula and throughout the upper limbs.
- Alignment of shoulder girdle with facilitation and activation of appropriate musculature and stability, and inhibition of inappropriate activity of upper trapezius and levator scapulae activity in varying ranges and movement patterns. Specific activation of lower trapezius, serratus anterior, rhomboids and triceps.
- Activation of trunk and core stability through upper limb activities in supine and lower limb activities in crook lying.
- Accessory movements of shoulder girdle.
- Family were taught passive and assisted stretches, sensory stimulation and the patient encouraged to carry out sensory stimulation independently.

Active rehabilitation

- During this period the patient commenced attending the gym, spinal cord injury education sessions and multidisciplinary goal planning.

- Long-term and short-term goals were identified and broken down into component parts, working towards independent mobility through walking, knowledge of all aspects of spinal cord injury, independent management of skin, bladder and bowels, independent feeding and activities of daily living.
- Employment, driving and leisure activities were discussed, but specific goals were not set by the patient.
- Throughout the rehabilitation process the patient and his wife, when able, had regular sessions with a clinical psychologist to address psychological factors, which included reduced insight into the long-term implications of his injuries.

Assessment

- In addition to the initial assessment the following points were identified during the rehabilitation process:
  - Decreased trunk mobility
  - Altered alignment of trunk and postural control in sitting, standing and during gait
  - Decreased weight bearing through left lower limb in standing and during stance with altered alignment and activity around pelvis, hip and knee
  - Decreased stability around pelvis
  - Over-activity of back extensors to provide pelvic stability
  - Over-activity of left latissimus dorsi to gain swing on left
  - Weakness of gluts, quads (L>R)
  - Reduced muscle length specifically hip flexors and plantarflexors (L>R).

Management

- Sensory stimulation, soft tissue mobilisation, alignment, activation and carryover into function of upper limbs through therapy facilitation and use of FES (functional electrical stimulation) particularly for scapula alignment and external rotation.
- Weight-bearing exercises through upper limbs to improve dynamic stability and sensory stimulation.
- Trunk mobilisations.
- Alignment and postural control activities in sitting, standing and moving into weight transference, step standing and gait.
- Attendance at Pilates class to improve postural control.
- Early gait rehabilitation using body weight support treadmill and overground therapy facilitation and progression through to step ups and stairs.
- 2–3 times weekly aquatic therapy to address soft tissue length, early and late gait rehabilitation, swimming and strengthening.
- Independent stretching and exercise programme.
- Cardiovascular fitness activities, strengthening exercises, gait rehabilitation and

preparation for discharge using cross trainer, treadmill, exercise bike and rowing machine at local gym.
- Specific strengthening of gluteal and quadriceps muscles through therapy facilitation, sling suspension, FES, functional exercises (e.g. step ups) and use of a FES bike for 8-week period.
- Assessment and provision of Odstock Drop Foot Stimulator (ODFS) on left gluteals to improve pelvic and trunk stability and alignment and hip extension during gait.
- Trial of various splints and orthoses to improve alignment of upper limb at night and provide sustained stretch and to improve postural alignment during waking and mobilising hours.
- Regular assessment and outcome measures, e.g. 10-minute timed walk, 6-minute walk, BORG scale of exertion, range of motion, muscle power, visual analogue scale for pain.

Outcome

- Discharged home with no aids or wheelchair, using ODFS on left gluteal muscles to improve gait pattern.
- Able to walk 1 mile independently.
- Independent in all activities.
- Reduced activity, altered alignment and range of motion of upper limb and shoulder girdle (L>R).
- Referred for local community/out-patient neurophysiotherapy.
- Provision of stretching and strengthening programme using Pilates-based exercises.
- Able to attend local swimming pool and gym.
- Able to participate in family life.

Chapter 16 Spinal injuries multiple choice questions

1. What is the estimated incidence of spinal cord injury (SCI) per year in the UK?
   a). 200–500
   b). 800–1000
   c). 2500–3000
   d). 5000–6000
2. Which of the following statements is true?
   a). A newly qualified physiotherapist is unlikely to see a SCI patient in their first year of practice
   b). A newly qualified physiotherapist is likely to see a SCI patient in their first year of practice, but only those with an established injury
   c). A newly qualified physiotherapist may be required to see a SCI patient in their first year of practice, but only new traumatic injuries
   d). A newly qualified physiotherapist may not see a SCI patient in their first year of practice, however there is always a possibility, so access to some background

knowledge is advisable

3. A physiotherapist, regardless of their experience, when presented with a SCI patient, should:
   a). Consider which of their neurological skills they will use for this primarily neurological presentation
   b). Not assess or treat a SCI patient until they have spoken to a specialist SCI centre
   c). Consider how their neurological, musculoskeletal or respiratory background could assist the management, potentially using a combination of all three as they are interlinked
   d). Liaise with their closest SCI centre only once a referral has been made to them.
4. According to recent data, the most common mechanism for a traumatic SCI in the British Isles is?
   a). Road traffic collision
   b). Falls
   c). Sport
   d). Assault/violence
5. The majority of reported SCI occur in the ...
   a). Cervical spine
   b). Thoracic spine
   c). Lumbar spine
   d). Sacral spine
6. The 'neurological level' in SCI is considered to be ...
   a). The first segment of the spinal cord where neurological impairment is evident
   b). The last level of normal neurological function
   c). The predicted spinal cord level the treating team believe function will return to
   d). The level of the vertebral fracture
7. A patient presenting with an AIS (American Spinal Injury Association [ASIA] Impairment Scale) C injury is considered to have ...
   a). An injury affecting the cervical spine
   b). A complete spinal cord injury
   c). A motor incomplete SCI, the majority of 'key muscles' having an Oxford grade less than 3
   d). A motor incomplete SCI, the majority of 'key muscles' having an Oxford grade greater than 3
8. The C6 'key muscle' used in the ASIA standard neurological classification of SCI is ...
   a). Wrist extensors
   b). Elbow flexors
   c). Elbow extensors
   d). Shoulder abductors
9. Which statement about respiratory function post SCI is true?
   a). Only patients with tetraplegia may require a manual assisted cough
   b). Deterioration in respiratory rate and vital capacity is potentially the first sign of

ensuing respiratory failure and may be present even when $PaCO_2$ remains within normal limits

c). Manual techniques, especially assisted coughs, are contraindicated in an unstable spine

d). A patient with an injury at C2 has no respiratory muscles remaining innervated

10. Which of the following statements is false?

a). Passive hip flexion should be limited to 30° in an unstable spine T10 and below, unless otherwise instructed by your consultant

b). A loss of just 5° of range in elbow extension can make an otherwise independent patient with C6 tetraplegia require assistance

c). Preservation of pin prick sensation has been linked to a likelihood of motor recovery in the related myotome

d). Passive shoulder flexion should never be taken above 90 degrees in an unstable cervical spine

11. When assessing muscle function in a SCI patient, a physiotherapist should?

a). Allow visualisation of the limb being tested, as loss of proprioception does not always mean loss of motor function

b). Be aware of typical 'compensations' developed by patients of a given neurology, and use appropriate handling during the process to allow assessment of true preservation of motor function

c). Take into consideration a patient's age, as well as any pain, abnormal tone, sedation or psychological factors which may alter the outcome

d). Incorporate all of the above in the assessment

12. An otherwise uncomplicated patient presenting with C6 complete tetraplegia has the functional potential to?

a). Floor to chair transfer independently

b). Wheelchair to car transfer independently

c). Self propel a manual wheelchair, but only on flat surfaces

d). Write a letter, but only using a computer, not with a pen and paper

13. Hypertonus in SCI …?

a). May be due to bladder or bowel distension, not only altered neurological control and secondary adaptations of passive musculoskeletal components

b). Should always be eliminated, as it serves no functional purpose

c). Is assessed using the Ashworth Scale only, as all other assessment tools are of no benefit to the clinician

d). Should never be managed with a positioning program as this may affect spinal alignment

14. Which of the following statements is true?

a). Physiotherapists are unable to assist skin management, so any issue should be left to the tissue viability nurse

b). A SCI is a localised central nervous system disorder, as such; it is highly unlikely that any cognitive impairment will be evident in the vast majority of patients

c). Psychologically, a SCI may have an impact on not just the patient, but also their family, friends, other patients and staff. All should be considered within the delivery of care

d). A collar or brace is required when there is spinal instability, so these should only be seen on patients on a turning bed

15. Which of the following transfers may a physiotherapist be required to assess and teach in a patient with T10 paraplegia?

a). Floor to chair

b). Bath transfer

c). Chair to car

d). All of the above

16. Factors that may affect a patient achieving their functional potential for a given level include all the following except:

a). Pain or spasm

b). Gender or race

c). Body shape (morphology) or previous medical history

d). Age or psychological factors

17. Initial acute management in SCI does not always need to include?

a). Adequate management of pain

b). Maintenance and optimisation of spinal alignment

c). Prophylactic respiratory, joint and skin management

d). Intravenous high-dose methylprednisolone

18. The suggested management of unopposed vagal tone in acute tetraplegia and the related risk of recurrent bradycardia and asystolic arrest is ...

a). Insertion of a temporary pacemaker

b). Pre-oxygenation and use of a sympathomimetic prior to physiotherapy, especially suctioning

c). Avoiding delivery of chest physiotherapy until the symptoms resolve, as this is most likely to stimulate the response

d). Using a mechanical insufflator–exsufflator (e.g. Cough Assist™) instead of manual assisted coughs

19. The 'tenodesis grip' is an allowable compensation wherein ...

a). Controlled active shortening of the long finger and thumb flexor tendons assist a patient with C6 or C7 tetraplegia achieve a functional grip

b). Active wrist flexion results in a functional grip for those with C6 or C7 tetraplegia

c). Patients with C8 tetraplegia achieve active finger flexion for grip

d). All 10 digits of the hands are used for a functional task in tetraplegia

20. When mobilising a SCI patient into a wheelchair for the first time, the physiotherapist should ensure ...

a). They have been able to maintain supported balance on the edge of the bed first

b). An abdominal binder has been used continuously for the 24 hours prior to mobilisation

c). Ephedrine, antiemetics and analgesia are given immediately after the patient is in the chair

d). The patient has spent time beforehand sitting up in bed using the inbuilt bed mechanics

Spinal injuries multiple choice answers

1. b)
2. d)
3. c)
4. b)
5. a)
6. b)
7. c)
8. a)
9. b)
10. d)
11. d)
12. b)
13. a)
14. c)
15. d)
16. b)
17. d)
18. b)
19. a)
20. d)

Chapter 17

Trauma Orthopaedics

Inpatients

- Trauma orthopaedics does not have to be complicated. There will be many different challenges that will not be encountered in other areas of physiotherapy.
- With a little preparation and knowledge about traumatic injuries and fixation, the management of patients in this setting becomes much easier and also much more enjoyable.
- Following the assessment set specific, measurable, appropriate, realistic and timely (SMART) goals and treatment plans in conjunction with the patient.
- From the first treatment session, the patient's discharge should be planned.
- Where will they go after discharge?
- What assistance will they need?
- What follow-up will be required?
- The majority of patients require physiotherapy outpatient treatment, which may be in a trauma outpatients setting, in the patient's home or in an outpatient department near to the patient's home.
- Wherever they are treated, the physiotherapist will need a detailed referral including details of the injury, the operation, post operative instructions, past medical history, neurovascular status, previous and current range of movement (ROM) and power, previous and current mobility, physiotherapy treatment received, any complications of surgery or treatment, drug history at discharge and any follow-up dates to visit the surgeon. Most trauma wards have a template for this information.
- Understanding a patient's injuries will influence the treatment plans and also the referral to outpatient physiotherapy.

Fractures

- Knowing how to describe a patient's fracture can sometimes be complicated; however, breaking this down into sections will make it far simpler.
- The description of a fracture should enable any physiotherapist to have a good appreciation of a fracture without reference to an X-ray.
- The following questions will provide the information that will provide a clear description of any fracture.

Open and closed fractures

- If a fracture is exposed to the environment, then it is considered to be an open injury.
- This can be caused by the bone penetrating the skin from the inside or from something penetrating the skin from the outside.
- If the injury is not open to the environment, it is considered to be closed.
- Open fractures will obviously have wounds associated with them and also have a much higher risk of infection and this is crucial information for outpatient physiotherapists.

Intra-articular or extra-articular?

- Does the fracture involve the joint surface or not?
- Intra-articular fractures can have a slower rate of healing and will also have a greater effect on joint movement.
- Do not need to mention if the fracture is in the middle third of the bone.

Types of fractures

- The type of fracture a patient has sustained will be a major determinant of the stability of the fracture, the subsequent treatment choice and weight bearing status (Table 17.1).
- The majority of fractures only contain two fragments and are classified as 'simple' fractures.
- If the bone has been fractured into more than two fragments, then it is classified as being 'multi-fragmented', also known as 'comminuted'.
- In some cases it is beneficial to include the number of fragments, e.g. a proximal humerus fracture, can be written as a two-part fracture (simple surgical neck fracture); a three-part fracture (surgical neck and greater tuberosity fractures); or a four-part fracture (surgical neck, greater and lesser tuberosity fractures).
- It is important to know the different types of fractures and their subdivisions and worth having an orthopaedic textbook available to assist with this (McRae 2006). The main types of long bone fractures encountered will be simple transverse, oblique or spiral.
- Basically, a transverse fracture will be more stable than an oblique fracture, which is usually more stable than a spiral.
- In some cases, a transverse fracture will be stable enough to put weight through without causing any displacement.

Table 17.1 Types of fractures

Type of fracture	Subdivisions
Simple	Transverse, oblique, spiral

Wedge	Bending, spiral
Multifragmented	Segmental, irregular

The bones involved and location of the fracture

- Name the specific bone that was fractured.
- Describe whether left or right and where the fracture is on the bone.
- For long bone fractures, divide the bone into thirds – proximal, middle and distal.
- Name the section where the main part of the fracture occurs.
- If a fracture extends over two sections, this can be recorded as being at the junction, e.g. middle/distal.
- There are several bones throughout the body where it is more beneficial to describe specifically where the fracture occurred: e.g. 'distal' phalanx, 'transverse process' of the vertebra, 'posterior' rib, 'neck' of the talus; 'distal pole' of the scaphoid.

Angulation

- Angulation occurs when the two main fragments of the fracture are still in alignment, but are at an angle to each other. This is quite common, e.g. radial fractures (Figure 17.1).
- The direction of angulation is described according to the direction the fracture site is pointing (consider the two fragments forming an arrow pointing in the direction of angulation), e.g. Colles fractures may have a 'dorsal' angulation.

Figure 17.1 Forearm fracture dorsal angulation.

Displacement

- Displacement occurs when the two main fragments of the fracture are no longer in alignment with each other.

- This can occur when the muscles pull the fragments in opposite directions.
- The displacement is described according to the direction of displacement of the distal fragment, e.g. medial or lateral; posterior or anterior; volar or dorsal; varus or valgus (Figure 17.2).
- The extent of the displacement is described by the approximate percentage that it is displaced (Figure 17.3a, b).
- Each bone will have its own classification systems, e.g. Schatzker classification system for tibial plateau fractures.
- These classification systems may not be known to the outpatient physiotherapist; therefore, although it is reasonable to include them in a referral, also include a full description of the fracture.

Figure 17.2 100% laterally displaced humeral fracture.

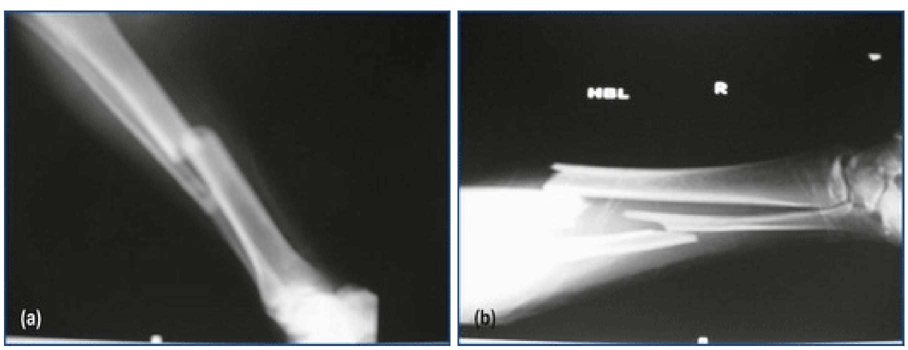


Figure 17.3 (a) Closed transverse fracture of the middle third of the (R) tibia with a 100% anterior displacement. (b) Also present is an associated 'closed oblique fracture of the middle third of the right fibula with 80% anterior displacement'.

Principles of fracture fixation

- When a patient is admitted with a fracture, the surgeon will make a decision whether to treat them operatively or non-operatively.
- If they choose to fix the fracture, they will base the decision on four principles that will

give a patient the best chance to return to their premorbid state (Table 17.2).

Table 17.2 Four principles used to choose method of fracture fixation

1. Stability	The type of fixation used will be based on the stability needed to allow the correct type of healing to occur (i.e. relative versus absolute stability)
2. Preserve soft tissue	Soft tissue is essential in the healing process, so it is necessary to preserve this when inserting metal work
3. Anatomical reduction and fixation	Anatomical reduction is needed to allow muscles and joints to function properly and unless alignment, length and rotation are correct, the patient will have irregular movement and gait
4. Early ROM	The fracture should be stabilised sufficiently to allow early ROM, to encourage healing and prevent long-term stiffness

Healing process

- The healing process of a bone begins the moment it is fractured.
- Depending on where a fracture is located and the surgeon's choice of treatment, the bone will either heal by direct or secondary bone healing.
- The main difference between the two types of healing processes is that there is no callus formation with direct healing.
  - Direct healing (absolute stability), occurs if the fracture is intra-articular, extra bone in the joint would be detrimental to movement and therefore, the surgeon will aim for direct healing. For this to be achieved, there must be no movement at the fracture site (absolute stability), and is achieved surgically by inserting a locking plate.
  - Secondary healing (relative stability), used for extra-articular fractures and is achieved via operative and non-operative management. Movement will occur at the fracture site, resulting in callus formation, as the bone undergoes several phases from the inflammation stage right through to the remodelling stage.
- Many patients ask about the healing process and the physiotherapist should familiarise themselves with both of these processes.

Factors affecting bone healing

- There are many factors that will influence fracture healing.
- These can be found in any orthopaedic textbook, but some of these factors are set out in Table 17.3.
- There are other factors that can affect bone healing such as steroid use, hormones, cancer and radiotherapy.
- The physiotherapist should be familiar with these and the background information

relating to the factors in Table 17.3 as a patient's surgeon will discuss many of these factors with them, but patients often ask their physiotherapist for clarification.

- Although not expected to be an expert on these factors, a physiotherapist should be able to encourage a patient to give themselves the best opportunity to recover as quickly as possible.
- Therefore, a little knowledge of each of these factors will help provide answers to a lot of a patient's concerns.
- The patient will not be able to influence most of the factors listed in Table 17.3; however, there are a few specific points that require advice from a physiotherapist (Table 17.4).

Table 17.3 Factors influencing fracture healing

Factor	How it affects bone healing
Age	In general, younger patients will heal quicker and have a greater ability to remodel than older patients
Smoking	There is a lot of research to suggest that people who smoke are more at risk of complications, e.g. delayed or non-union and increased healing times of the fracture and wound
Diet	Bone and soft tissue healing requires a large amount of calories, proteins and minerals
Systemic diseases	Diseases such as osteoporosis and diabetes will delay the healing process as they significantly reduce the number of proliferating cells
Degree of trauma	The more extensive the injury is, the more disrupted the surrounding soft tissue and the slower it will heal
Degree of immobilisation of the fracture	Fractures require some form of immobilisation to heal; therefore, if there is repeated disruption of the repairing tissue it will affect healing
Intra-articular fractures	Reasons for impairing healing include: Synovial fluid has collagenases which retard bone growth Joint movement can cause the fragments to move and hence, slow healing
Vascular injury	Bones need nutrients to heal and these nutrients are delivered to the bone via the blood supply from arteries, periosteal circulation and soft tissue If this is disrupted, bone healing is affected
Loss of bone apposition	Bone needs to be in relative contact to heal Therefore, if there is separation or interposition of soft tissue it will affect bone healing
Infection	Colonisation of bacteria can cause necrosis and oedema at the fracture site, which will slow and even stop bone healing

Table 17.4 Specific factors that physiotherapists can advise patients about

Factor	Advice

Smoking	Patients should be encouraged to stop smoking, especially during the first 3 months as most healing occurs then Involve a smoking cessation nurse to discuss assistive options, e.g. patches or gum Alternatively refer the patient to their GP for advice
Diet	Encourage patients to maintain adequate calorie intake, ensuring a balanced nutritional diet This can be difficult due to loss of appetite or nausea Involve a nutritionist to suggest foods or supplements that will enhance the healing process
Systemic disease	Ensure specialised nurses, such as the osteoporosis nurse or diabetes nurse, are involved as appropriate They will be able to give your patient the specific medication and advice that they need to help the healing process and prevent future problems
Infection	Advise patients to keep wounds covered and pin sites clean Avoid touching a healing wound, will help prevent infection

Types of fixation

- Once the surgeon has decided on the type of fixation as outlined in Table 17.4, they will choose the type of metalwork to achieve the best fixation.
- There are many types of fixations that will be encountered that are used with different types of fractures (Table 17.5).

Table 17.5 Types of metalwork, fixation types and fractures associated with these

Metalwork	Type of fixation	Example
Wires	Kirschner wires – to hold the fracture together Circlage wires – wraps around the bone to hold it together Tension band wiring – used to compress the fracture together (relies on active joint movement to work properly)	Extra-articular distal radius fracture Periprosthetic proximal femur fracture Patella fracture
Screws (minimally invasive)	Lag technique – to compress the fracture Positional technique – to hold the bones in the correct position	Medial malleolus fracture Sacroiliac joint disruption

Plates and screws	Neutralisation plate – to hold the bone in place and prevent bending and twisting at the fracture site Bridging plate – when there is a gap in the bone such as a multifragmented fracture, used to cross the fracture site and hold the bone out to length Compression plate – used to apply compression across the fracture site Locking plate – to ensure no movement occurs at the fracture site (absolute stability)	Distal fibula fracture Midshaft humerus fracture Radial shaft fracture Intra-articular tibial plateau fracture
Intramedullary nail	Antegrade – inserted from the proximal end of the bone Retrograde – inserted from the distal end of the bone	Tibial shaft fracture Distal femur fracture
External fixation	Pins and rods – to hold the bone out to length especially whilst soft tissue recovers Ilizarov – a more robust type of external fixator that holds the fracture site rigid. The system has the flexibility to be either more rigid or less, depending on whether more half pins are used (more rigid) or how much tension is applied through the wires	Open tibial shaft fracture or multifragmented distal radius fracture Generally used for non-unions or mal-unions of distal tibias in the trauma setting Both can be used if the soft tissue will not tolerate internal fixation

The influence of fixation on the physiotherapy intervention

- The type of fixation that a patient has will inform whether or not the patient's joint can be moved or they can weight bear on the operated limb.
- The same fracture can be fixed in different ways and this will influence the physiotherapy management (Table 17.6).
- In terms of weight bearing, metalwork that sits on the outside of the bone (plates, external fixators) tends to be a weight-sharing device, whilst metalwork that sits inside the bone (intramedullary nail) tends to be a weight-bearing device.
- Patients are more likely to be allowed to take some weight through their operated limb with an intramedullary nail than with a plate or external fixator (excluding Ilizarov frames).

- The surgeon should confirm this in their post operative instruction.

Table 17.6 Range of fixation methods used for distal radius fractures and effect on physiotherapy intervention

Fixation	Stability	Cast	Movement allowed
Kirschner wire	Weak	Non-removable	No movement allowed but can use fingers and thumb to do light functional tasks with fingers
External fixator	Weak	No cast but pins in radius and index metacarpal	No movement available at wrist and limited in fingers but can do very light functional tasks with fingers
Locking plate fixation	Strong	Removable	Movement allowed and functional tasks allowed but no lifting heavy objects

Other considerations

Pain

- Pain will play a major role in a patient's rehabilitation following a traumatic injury and their subsequent management.
- How this is managed will shape the style and duration of the rehabilitation programme and subsequent discharge.
- If pain is poorly controlled, patients will refuse to be treated or only allow minimal input.
- Too much pain relief leads to drowsiness, nausea, faintness and even a loss of function.
- Either way will lead to a suboptimal rehabilitation programme meaning a delayed discharge.
- A physiotherapist will not be expected to set up a pain relief regimen, but will be expected to know when a patient needs more or less pain relief.
- Most trauma centres have pain specialists or acute pain teams that may need to be involved with individual patients.
- Patients may need background pain relief, e.g. paracetamol, codeine or tramadol to help with the pain caused by the injury or surgery.
- For more severe pain, they may need fast-acting pain relief such as Oramorph.
- Patient-controlled anaesthesia (PCA) and patient-controlled epidural anaesthesia (PCEA)

machines may be another option that patients can use to gain adequate pain relief.

- Rehabilitation may cause increased pain; therefore, it is often prudent to ensure patients have extra pain relief prior to a treatment session.

Neurological issues

- Patients may have incurred associated injuries to the spinal cord, peripheral nerves or a head injury.
- Temporary or permanent neurological damage is often encountered in patients following involvement in a high-energy accident.
- Recovery time can be very slow, taking many months to show tangible signs of improvement.
- Neural integrity and extent of damage is determined in a number of ways, from magnetic resonance imaging to direct vision during surgery.
- Most surgeons will adopt a 'wait and see' approach if neural damage is considered temporary or occasionally patients may undergo nerve conduction studies to provide information about neural status.
- If neural function is altered, it is the responsibility of the physiotherapist to ensure it does not lead to complications, such as muscle shortening.
- Patients in bed for long periods require correct positioning to avoid muscle shortening and long-term complications (Table 17.7).
- Early intervention prevents more debilitating problems in the future.
- Casts or splints can be useful in these circumstances which should be ordered via plaster room technicians or occupational therapists as soon as possible.
- If sensation is affected, monitor their skin condition whilst using these.
- Educate a patient and their family about the possible complications and encourage them to be actively involved in preventing them.
- Teaching regular passive stretches and providing equipment to assist this is crucial, e.g. a bandage to self stretch ankle dorsiflexion.
- Lower limb neurological deficits can be helped by orthoses, e.g. a 'foot up' splint will assist a patient achieve a better 'heel-toe' gait pattern, by maintaining dorsiflexion during the 'swing through' phase.
- Despite orthoses, patients need educating about correct gait patterns, ensuring they comply with their weight-bearing status.

Table 17.7 Example of the consequences of delayed intervention

A patient suffers an acetabulum injury and bruised sciatic nerve following a fall, which leads to a temporary foot drop
The foot drop is not corrected early enough and despite the nerve recovering the patient has shortened plantarflexors
The long-term shortening of the plantarflexors leads to gait issues, due to the lack of dorsiflexion and inability to generate power during 'push off'

Complications

- There are many short-term and long-term complications that can arise from traumatic injuries (Table 17.8).
- Table 17.8 is not an exhaustive list and further reading is recommended.

Table 17.8 Examples of complications that can occur following a traumatic injury

Complication	Signs and symptoms
Infection	Redness and pain around the incision site. Can sometimes have a bad aroma Possibly raised temperature and increased CRP. Night sweats are possible
Wound breakdown	Redness around the wound and persistent oozing
Pulmonary emboli	Breathlessness, drop in oxygen saturation
Deep vein thrombosis	Pain, swelling and redness in the affected area
Fat embolus	Breathlessness, agitation, tachycardia, pyrexia, cyanosis
Compartment syndrome	Severe pain especially with passive stretches; swelling and tight compartments on palpation; sensory, vascular or power disturbances
Implant failure	Sudden increase in pain whilst moving

Starting treatment

- Often it is quite difficult to know where to start when faced with a complex patient.
- Whatever the injuries it is useful to take some time after completing the assessment to plan SMART goals and the immediate treatment session.
- It is essential to include the patient in this process, as goals must be patient-centred and achievable.
- With patients that have painful injuries or following surgery, it is crucial to consider the pain when planning early treatment sessions.
- Break the management down to simple components that will enable effective treatment of even the most complex of patients.
- Treatment sessions will involve ROM, power, joint position, function and discharge planning.

Chest treatment

- Patients may need chest management for routine chest complications or for complications due to general anaesthetic and specific chest trauma.
- Chest trauma is often encountered on a trauma ward and it is a good idea to know about the common types of injuries, e.g. rib fractures or flail segment, pneumothorax, haemothorax, lung contusion or surgical emphysema.
- For information about the assessment and treatment of these conditions the reader should consult a respiratory text.
- The most common chest injury is rib fractures, with the main issue being pain.
- The pain team should be involved as soon as possible, as without adequate pain relief it will be difficult to deliver an effective treatment, which can lead to pulmonary complications in a third of patients with rib fractures (Zeigler 1994).
- Spinal cord injured patients will need chest treatment and the reader is referred to the chapter on spinal cord injuries for information on chest and other management.

Treatment considerations

- When planning a patient's treatment consider the entire hospital admission period and not just the post-stabilisation period.
- It is not unusual for a patient to be waiting in bed for up to 2 weeks for their operation, allowing swelling to subside or a specific surgeon to operate.
- Bed rest leads to many complications such as chest problems, muscle weakness and shortening, decreased fitness and possible pressure areas.
- Any injured joints should be resting in optimal positions, with or without a cast, to protect against muscle shortening.
- Think about preventing complications, a lot of treatment needs to be delivered before stabilisation of the injury has been completed.
- Once stabilisation of the injury has been achieved, treatment will largely depend on the surgeon's instructions.
- Once treatment goals have been set, rehabilitation can begin (this will include the prevention of complications), towards achieving the planned discharge from hospital.
- The following sections outline the basis for treatment goals and plans. These can be used irrespective of the type of management the surgeon advocates.

Range of motion

- ROM is affected in some way in all patients.
- It is very beneficial to start ROM early after an injury, to help the healing process and prevent long-term restrictions; therefore, consult the surgeon to ensure this is possible.
- Determine why a patient's range is reduced, are there any factors that physiotherapy can

influence (Table 17.9).

- Always check the surgeon's instructions before commencing joint movement. Although early ROM is a principle of fixation, there are reasons why movement may be delayed.
- Wounds may need to be completely dry or healed before any movement is allowed or a patient's bone quality or fixation may not be strong enough to withstand movement, e.g. osteoporosis or Kirschner wires in situ.
- Manual treatment, such as passive or active assisted ROM, is very effective initially and can help to alleviate a patient's anxiety (Hengeveld and Banks, 2005).
- However, patients need to know how to work on their ROM independently. Active ROM or active assisted ROM using aids such as a bandage or a sliding board should be taught.
- Techniques such as passive intervertebral movements (accessory or physiological) can maintain movement in joints that have not been injured and proprioceptive neuromuscular facilitation techniques, e.g.contract–relax, can be used to improve functional movement.
- For patients who are very anxious or cannot do any movement for themselves, use of equipment such as continuous passive movement (CPM) machines may be necessary.
- Teaching the patient to use their injured limb functionally will help to improve range, e.g. walking with a proper 'heel–toe' gait pattern will help to mobilise the ankle and knee and lengthen the surrounding muscles.
- Showing a patient how to use their injured arm to eat and comb their hair will encourage movement in their upper limb joints.
- Ensure the postoperative instructions are followed whilst teaching these functional exercises.
- Be cautious when moving joints that have associated wounds or incisions as excessive movement can cause wound breakdown.
- It is crucial that wounds heal properly, avoiding complications from infection.
- Some surgeons instruct that movement of the affected joint is left for up to 2 weeks, to ensure adequate healing before movement is begun.

Table 17.9 Factors affecting ROM and physiotherapy interventions

Factor	**Physiotherapy influence**
Swelling	Due to the inflammatory response to the injury and subsequent surgery RICE treatment and gentle movement are very beneficial Cryocuff to cool and compress the injured area
Pain	Ensure adequate pain control before starting any ROM treatment Gentle ROM can decrease a patient's pain and relieve muscle tightness or spasm, joint stiffness and anxiety
Soft tissue tightness	Usually due to lack of movement and poor joint position, a risk for patients enduring several days of bed rest ROM exercises and stretches are used to lengthen tightened structures and to regain normal length

Anxiety	Passive ROM or CPM can start to move joints, leading to decreased pain and increased patient confidence to move their affected limb

Muscle power

- Improving muscle power can be difficult in the early stages of rehabilitation due to reduced ROM, swelling and pain.
- Gentle strengthening exercises should be started, when permitted, as soon as possible after fixation, to prevent further muscle weakening and to promote healing.
- Active and active assisted ROM, isometric and isotonic contractions are very useful in the initial stages.
- Resistance training with weights or Thera-Band is restricted during the early healing phase, but may be permitted if the fracture has a stable configuration and strong fixation.
- Patients with weakness due to neural problems, e.g. foot drop due to sciatic nerve bruising, will fatigue easily.
- Exercises should be undertaken on a 'little and often' basis with little or no resistance and progressed as function returns.

Function

- In addition to the musculoskeletal treatment consider function, mobility and discharge planning.
- As in many other acute specialties the physiotherapist will often be the first person to mobilise a patient.
- Think about the patient's injuries and how they will affect their function and mobility. What functional tasks can they do?
- When should they be mobilised?
- What is their weight-bearing status?
- What restrictions do they have?
- How did they mobilise premorbidly?
- How many people will be required to mobilise the patient?
- What equipment will be needed?
- What does the patient have attached, e.g. catheter?
- Assessment should provide most of the answers and therefore it should be possible to organise the environment and have any equipment in place before mobilising the patient.
- Ensure that there is sufficient space and follow correct manual handling procedures to ensure there is as little risk attached to the process as is reasonably practicable.
- Initially when teaching a patient how to move in bed, get out of bed or stand up, use equipment that is available to make the task as easy as possible, e.g. electronic beds to sit the patient up, overhead rings, stand hoists or rota stands.
- As the patient progresses ensure that the rehabilitation mimics their home environment

as much as possible, e.g. standing up from a low bed.
- Once the tasks are mastered then it will be necessary to work with other multidisciplinary team (MDT) members to ensure the patient has any equipment they may need at home to enable them to function safely.

Mobility

- The priorities should be the safety of everyone involved and adherence to the postoperative weight-bearing instructions.
- It is advisable to start with a mobility aid to ensure the safest possible mobility, even if it is considered that the patient could use a less supportive aid, e.g. get a young patient with an ankle fracture to mobilise with a frame, progressing onto crutches.
- The patient's injuries will tend to dictate what equipment they will need to mobilise with. The assessment findings will determine this before commencing treatment, e.g. a patient with a pelvic and a distal radius fracture will need a gutter frame or gutter crutch for their injured arm, just as a patient with bilateral lower limb injuries will need a wheelchair and sliding board.
- For patients living in multistoreyed accommodation, they will need to be taught the safest way to mobilise up and down stairs. This may involve using two crutches, a rail or going up and down on their bottom.

Gait

- Unless a patient is non-weight bearing, the aim should be to achieve a 'heel–toe' gait pattern.
- The physiotherapist should ensure that they are familiar with the phases of gait. Always follow postoperative weight-bearing instructions.
- Refer to the assessment chapter in the first volume of this book for outlines of weight-bearing status.

Discharging a patient

- Discharge planning starts during the assessment.
- In summary, once a patient has been taught a routine of exercises, is mobilising safely and independently and the home environment is prepared they can be discharged from the acute inpatient setting.
- Prior to discharge ensure that they have a comprehensive home exercise programme with written instructions and an outpatient physiotherapy follow-up appointment, by faxing a completed referral to their relevant outpatient location.
- Most of the referral will have already been filled out during the assessment, but will require the addition of information about the patient's current neurovascular status, ROM, power, a summary of treatments given and any future appointments they have

with the surgeon.

Summary

- Working in an acute trauma orthopaedic unit may involve working with complex multitrauma patients.
- Treatment of these patients involves breaking their treatment sessions down into planned, manageable sections.
- A good treatment programme depends on the physiotherapist having a good understanding of a patient's injuries and the surgery, a good assessment and treatment plan and an awareness of when to progress treatment appropriately.

Trauma outpatients

Referral

- Trauma patients will be referred in a number of different ways for physiotherapy outpatient treatment.
- It is best if the patient's physiotherapy can be performed as close to their home as possible, to enable them to attend regular and frequent treatment appointments.
- This may mean that an outpatient department could receive referrals from accident and emergency departments, trauma clinics or inpatient units from across the country, or even the world.
- A consequence of this is that there will be differing levels of communication that accompany referrals regarding prior treatment given medically or therapeutically, the patient's expected progression and any planned outcomes.
- If the information provided is missing specific details it may be necessary to contact the referrer to ensure that you have the information that you need before commencing treatment.
- The referrer should have provided a reasonable baseline of information, so that it is possible to treat the patient according to their plan.
- X-rays or scans can be requested for information and these may be received as film images or accessed via digital systems, a radiology report may accompany the patient's referral in some cases.

Communication with the referrer

- If the patient returns to the referring clinic for further assessment regarding their progress, or for tests, e.g. X-rays, a letter can be provided that they can take with them or

one can be sent to the clinic, which can request any additional information required.

- Any response can be posted or brought back by the patient. It may be necessary to contact the consultant via their secretary or the clinic, if the need for information is pressing.
- The patient's GP can be an additional source of information, as they should receive reports from the clinic.
- Clinic and GP communication should be used regarding onward referral, problems with analgesia and for further opinions regarding the patient's signs and/or symptoms.

Urgent communication with the referrer

- At the beginning of the treatment session it is important to reiterate that if anything untoward is found during the assessment of the patient, the priority for treatment may be getting the patient referred to the right person for their management, e.g. in the event that a patient is identified as having a deep vein thrombosis (DVT), grossly infected wound, evidence of compartment syndrome or a highly unstable joint.
- This may take a few phone calls and it is important to do this at the earliest opportunity following the assessment.
- It is important not to delay the appointments of the other patients due to be seen, therefore it may be necessary to enlist assistance from another physiotherapist or the receptionist to cover patients or make the necessary calls.
- A more experienced member of staff should provide support during this process.

Goal setting

- Following the assessment of the trauma outpatient, it is essential to create a list of problems that the patient and physiotherapist have identified as needing to be treated.
- This list, which should be written down, may seem extensive and will need prioritising to define the way in which the patient will be treated.

Problems likely to be encountered

- The main problems likely to be encountered are:
  - Psychological issues
  - Acute inflammation
  - Pain
  - Swelling
  - Wound complications
  - Decreased ROM
  - Hypermobility of joints
  - Decreased muscle strength
  - Decreased muscle length

- Decreased proprioception
- Poor gait pattern
- Neurological signs and symptoms.

- These problems may be interconnected, but for discussion purposes in this chapter, they have been divided up into subsections.
- All the problems need to be managed within the individual treatment goals set for the patient and within their management plan defined by the medical team. The patient's past medical and drug history will need to be considered alongside the problems before any intervention takes place.
- If a patient sustains an intra-articular fracture, they are less likely to get full range of movement back in that joint, especially if the fracture is fixed internally.
- This needs to be explained to the patient early on in their rehabilitation so that you are both working towards the same expectation.
- You may need to refer the patient back to their surgeon if they are not progressing as you would expect, asking the surgeon how much progress they were expecting them to make and treat the patient accordingly.

Psychological issues

- The psychological impact of a traumatic accident, whether it is a simple wrist fracture or a complex polytrauma, needs to be considered before any treatment is commenced.
- If a patient is highly distracted by their emotions, then they are less likely to be compliant with treatment. It is, therefore, important to allow a patient to express these emotions during the session.
- If a patient has said something that suggests they are potentially holding back a lot of emotion, do not be afraid to ask about it, as often all the patient needs to do is talk and all you need to do is listen.
- Physiotherapists are not trained in counselling, but a good understanding of how a patient is feeling will significantly improve the therapist–patient relationship.
- In addition a conversation may provide details that will be essential if other MDT members need to become involved in the patient's management.
- The reader is referred to the chapter on rehabilitation which covers other aspects of the patient's psychological state. Common examples of post-trauma emotions are outlined in Table 17.1.
- Patients may be unduly anxious about their pain, describing symptoms in general terms and indicating global areas of discomfort when asked to show where they are experiencing symptoms.
- It may help to encourage them to participate in their treatment, e.g. teaching how they can reduce swelling using ice or by applying massage to the area.

Acute inflammation

- The management of acute inflammation is a priority in the treatment plan when dealing with soft tissue injuries.
- The main symptoms of acute inflammation are redness, increased temperature, pain, swelling and loss of function.
- The use of protection, rest, ice, compression and elevation (PRICE) is advocated by the ACPSM in their clinical guidelines for practice during the first 72 hours of management (CSP, ACPSM 1998). This document provides detailed advice about the use of PRICE and is essential reading for any physiotherapist managing acute inflammation associated with an injury.

Pain

- Pain is the main problem that will be encountered when dealing with trauma patients. It can greatly hinder the patient's physical and psychological progress.
- It is important to consider why the patient is experiencing a particular pain, in the particular location after a specific injury.
- Once the acute inflammation has been managed, pain will need to be controlled.
- Pain can be due to structures inside and around the joint.

Excessive activity

- Pain can often be caused by the patient trying to do too much, too soon or overdoing activities.
- This can sometimes be due to frustration related to the healing process, and can present with a boom and bust lifestyle.
- It is important in these situations to talk the patient through the process of pacing and finding a baseline of activity that they can do every day.
- This change will require discipline and the patient will need strong support throughout the process (Butler and Moseley 2003).

Discomfort from internal fixation

- If a patient has had an internal fixation for a fracture, the stabilising metalwork can sometimes cause significant discomfort, which will lead to it being surgically removed.
- In the author's experience, in most cases metalwork will be left in situ for up to a year before it is removed, but in cases when it is essential, this will be carried out earlier.
- If there are any concerns about a patient's metalwork, e.g. it is very prominent, then advice should be sought from a more experienced physiotherapist, who can assist in making the decision whether the patient needs to be referred to the trauma doctors for a surgical opinion.

Pain modulation

- The drug history gathered during the assessment will indicate what the patient is taking for analgesia.
- Many patients fail to take medication as it has been prescribed for them.
- This can be due to a number of reasons:
  - Because they think they are better
  - They may dislike taking tablets
  - They do not see the need for them or think they are bad for them.
- Often a patient will not feel that they need pain relief because they are not doing their exercises as instructed.
- Once the exercises have been corrected patients often complain of pain, which is when the physiotherapist needs to reinforce the need to use analgesia.
- Physiotherapists generally do not prescribe medication, therefore advising patients to take medication prescribed for them or raising concerns about medication with the medical team or the patient's GP are the appropriate courses of action.
- If the patient is unhappy or has questions about their medication they should consult a pharmacist or their GP.
- General advice should be to tell the patient to follow the instructions that they have been given and that the recommended dosages are not exceeded.
- If the patient is on high-dose prescriptions of analgesia, then this should be managed by their GP. These patients can benefit from encouragement to use other modalities to help with pain relief, e.g. ice, soft tissue mobilisation or electrotherapy.
- Contemporary physiotherapists use a number of treatment modalities for pain, e.g. ultrasound or TENS, which can be beneficial for certain injuries.
- Consider precautions and contraindications for each of these modalities, especially as trauma patients often have wounds and/or internal metalwork (Robertson et al 2006).

Swelling

- Swelling is very common with any injury, whether it is a soft tissue injury or a fracture.
- The management of acute swelling should follow the PRICE guidance.
- Chronic swelling can be a problem as it causes limitations to movement, pain, functional problems, gait disturbance, as well as concern for the patient that they might be continuing to cause damage, adding to their injury.
- Before starting to treat swelling, it is important to consider why it is there, e.g. if a patient has had an ankle fracture, and has started weight bearing on it and the ankle continues to be swollen. This is a normal occurrence post injury, especially in the lower limbs, where it is difficult to get rid of swelling due to gravity.
- It is essential to be aware of problems such as deep vein thromboses and infection, which will present with swelling, but usually with heat, redness and tenderness. These will require emergency medical attention.
- In order to help patients understand why their limb keeps swelling, the following analogy can be useful.

- An uninjured body part is like a new balloon straight out of the packet; it is hard to blow up, as the rubber is tight. The injured body part is like an old balloon, which has been inflated for a few days, the rubber has been stretched and is easier to blow up. Therefore it is important to try to stop the limb from swelling initially, to avoid the structures from becoming stretched.
- There are various ways of controlling the swelling, e.g. by using Tubigrip or a compression sock, such as a flight sock, which the patient will need to wear all day (Clarke et al 2006).
- The support will provide external elasticity to stop the limb from swelling, allowing the body's own elasticity to 'retighten'.
- Another way to reduce swelling is by elevating the limb above the level of the heart on a regular basis throughout the day.
- The use of contrast baths or ice can be very effective in helping to decrease chronic swelling (Robertson et al 2006).
- Soft tissue techniques, such as effleurage can help to mobilise the swelling and remove it from the limb, allowing the soft tissues to recoil back to normal size.
- The patient should be encouraged to carry out treatments themselves as often as possible throughout the day.
- This will take effort and discipline, so the patient needs to be convinced that the treatment will benefit them, as it is important that the patient is compliant.
- The swelling could be being exacerbated by the patient overdoing activities, which will need to be identified during the subjective assessment.
- In this case, using pacing could help to reduce the swelling.

Complications

- After a patient has had an operation to reduce and fix their injury, they potentially will have a significant wound that will need monitoring.
- As a patient will visit physiotherapy regularly after their surgery, it will be possible to see changes that occur and will need to act to ensure that the patient is managed correctly.
- A wound that is red, hot, swollen and oozing will need to be shown to a senior physiotherapist and referred to a doctor for antibiotics.
- It is better to err on the side of caution and if there are any concerns, refer the patient to the trauma team or their GP.
- Once the wound has healed, it is important to keep the scar mobile to prevent it becoming tethered to the structures under it, which may be painful and restrict range of movement.
- Regular massage with and without moisturiser will help to mobilise the scar from the underlying tissues.
- The reader is referred to Chapters 4 and 14 for more information on scar and wound management.

Decreased ROM

- Decreased ROM is the most common problem after a traumatic accident.
- It may be due to a number of causes, e.g. pain and swelling or decreased muscle strength.
- Regaining full ROM after an injury is a priority, requiring guidance from the trauma medical team.
- Improving ROM will decrease joint hypomobility and enable muscle strength to be increased.
- The operation notes should provide clear guidance from the surgeons about how much ROM can be forced. If unsure, it is best to get advice from a senior clinician or the medical team.
- Passive ROM exercises, e.g. pendular shoulder exercises, can be very useful after the initial injury (e.g. a nerve palsy).
- Physiotherapists can use passive physiological movement exercises (PPM) to re-educate a patient's movements and to help increase range.
- Passive accessory and physiological movements were developed by a physiotherapist, Geoffrey Maitland, and are used widely in clinical practice by many physiotherapists (Maitland et al 2005).
- The use of PPM, often in combination with soft tissue mobilisation and passive accessory mobilisations (PAMs) can be very useful for improving decreased ROM.
- For decreased movement in the spine, passive physiological inter-vertebral movements (PPIVMs) and passive accessory intervertebral movements (PAIVMs) can be used with great success (Maitland et al 2005).
- Mobilisations with movement (MWMs), natural apophyseal glides (NAGS), sustained natural apophyseal glides (SNAGS) are also effective at increasing range. These are particularly useful for treating patients post fracture, with associated soft tissue healing, so as not to aggravate the injury or increase symptoms (Mulligan 2010).
- Active ROM exercises should be given to the patient to do on a 'little and often' basis and are done in conjunction with ice, heat or analgesia, whichever is appropriate for the patient.
- It is important that the patient understands why they are doing the exercise and that they are not doing any harm by performing controlled movements. This understanding helps to increase the patient's compliance.
- Patients can be taught active assisted exercises, e.g. using a towel wrapped around a foot to enable the patient to pull on this to assist the movements of inversion and eversion at the ankle, or using a walking stick in both hands to help with shoulder movements.
- Initially after surgery, e.g. tension band wiring, surgeons may wish to limit the amount that ROM is pushed.
- In this situation it may be better to do active movements without any additional assistance.

Hypermobility of joints

- With traumatic injuries such as dislocations, especially recurrent ones, there may be an issue with hypermobility, rather than hypomobility.
- Some patients may have hypermobility syndrome, which can be assessed using a Beighton Scale (Grahame et al 2000).
- If a patient presents with a first time dislocation, they may have been immobilised in order to enable the joint to stiffen up. It is the role of the physiotherapist to get them moving again and to strengthen the supporting muscles, i.e. the rotator cuff, to increase the stability of the joint.
- It is likely that the patient may redislocate the joint and if this becomes a recurrent problem the consensus opinion is that surgery will be required to provide a longer-term solution.

Decreased muscle strength

- Decreased muscle strength is often a finding of the assessment and may be a result of immobilisation, pain or injury to the muscle.
- If the assessment has found very little muscle activity, it can sometimes be helpful to perform some gentle soft tissue mobilisation to the muscle, which may have the effect of enabling it to contract more effectively.
- In the initial stages of treatment, it is possible to use active or active assisted exercises to build up strength, until the patient can achieve Grade 4 muscle power.
- Resistance at this stage can come in the form of weights or Thera-Band, which may be used to strengthen throughout available range. Body weight can be used as a resistance, e.g. press-ups against a wall, heel raises or single leg dips.
- It is important that these exercises are completed with no or minimal pain, so that the patient maintains their compliance.
- Exercises can be modified by changing the use of holds or slowing the movement down, relevant when trying to increase control at a joint.
- It is important to also consider a patient's proximal and core strength and incorporate training into their treatment. The use of pelvic and shoulder stabilisers can greatly change a patient's ability to perform a movement and reduce their symptoms, e.g. gluteus medius can be strengthened to prevent the knee dropping into a valgus posture during single leg dips.

Decreased muscle length

- In association with joint immobility and loss of range the muscles surrounding joints can become shortened.
- Stretching techniques can be used to increase muscle length; however, it is important that

the patient understands exactly how they should stretch and why they are doing it.

- There is evidence to show that muscles respond in different ways to different types of stretches, e.g. sustained stretches or ballistic stretches.
- A sustained stretch of up to 1 minute, repeated four times for each muscle group, may be the most beneficial method for lengthening tightened muscle groups (Bandy and Irion 1994, Herbert and Gabriel 2002, Gremion 2005).
- It is important that stretches are carried out on a regular basis and that they are performed correctly in order to achieve the desired outcome.
- Proprioceptive neuromuscular facilitation techniques, e.g. contract–relax, muscle energy techniques and myofascial release can also be used to increase the length of tight muscle tissue (Voss et al 1985, Chaitow, 2003, 2006).

Decreased proprioception

- Decreased proprioception in a limb can be responsible for re-injury if not included in the rehabilitation process.
- Following an ankle sprain, proprioceptive feedback is often disrupted, resulting in episodes of unexpected loss of control of the ankle on uneven surfaces which can lead to further ligament and/or bony injury.
- It is important to educate the patient about the role proprioception plays in preventing further episodes of the ankle 'turning'.
- Single leg standing, initially with eyes open, progressing to eyes closed, is a simple exercise that can be given to patients with ankle or knee problems.
- More demanding exercise may be required, e.g. single leg stands on wobble boards, throwing and catching objects, or passing a football round a stationary leg whilst standing on a wobble board.
- Progression can be achieved by combining activities and making the surface more unstable. The introduction of the Nintendo Wii Fit board has meant patients can receive information about their balance and test it through games.
- Sports players may need to achieve higher-level proprioception, therefore jumping, hopping and running on either flat or uneven surfaces may need to be added to their rehabilitation. They should be confident in doing this before returning to their sport.
- Proprioception in the upper limb can be improved by the use of weight-bearing activities, e.g. press ups against a wall or on the floor, useful after a shoulder dislocation.
- Difficulty can be increased using gym balls, e.g. legs supported on a ball and the patient weight bearing through their affected arm. This can be progressed by placing the hand onto a wobble board or cushion.

Poor gait pattern

- Pain and decreased range of movement cause the most issues with gait.

- In practice, patients view getting off crutches as a positive factor and tend to want to do this too early, resulting in them acquiring an antalgic gait pattern.
- A faulty gait pattern can result in secondary back, hip or neck pain due to the increased strain these areas are put under.
- It is better for the patient to walk well with crutches than badly without them, and the patient must be made to understand this.
- Following a fractured ankle dorsiflexion is often reduced in range and walking with crutches ensures that the patient achieves a 'foot flat' position during the weight-bearing phase of gait and then stretches into dorsiflexion when moving into the 'toe off' phase.
- Progressing to one crutch will require the patient to use the crutch on the opposite side to the injury, this will ensure a normal reciprocal gait pattern is achieved.
- When weaning the patient off the single crutch the process should gradually build up the amount of distance they do without it.
- It is important that the patient is assessed before they return to running or jumping. If they are unable to do this comfortably and with a reciprocal pattern, they require further work on their strength and/or mobility.

Neurological signs and symptoms

- Neurological symptoms are common after a traumatic accident.
- Nerve injury due to impact or stretch may leave the patient with decreased sensation, muscle strength and function, e.g. a patient with a humeral shaft fracture may have a radial nerve palsy, due to the nerve's close proximity to the bone.
- Nerve damage can also cause either sensitisation (increased sensitivity) or desensitisation (decreased sensitivity) of areas supplied by the nerve.
- If the patient has had decreased range of movement in the limb for a long time, or they have been holding themselves in an antalgic position, the nervous system can become symptomatic.
- Symptoms can appear after the injury and healing process are well established and the patient may describe symptoms that are different to their injury pain. The symptoms may be widespread and described as a toothache or linear and described as sharp shooting pain or by more unusual descriptions, such as feeling a tight wire running down the leg.
- It is important to assess the patient fully at this point for decreased range at the relevant spinal area and to undertake a neurological test (Petty 2006).
- First point of treatment is to address the cause of the problem, e.g. correcting and re-educating posture or gait pattern.
- The patient should be encouraged to move the limb, respecting their symptoms, this facilitates normal movement in the nervous system and increases cardiovascular activity, which will in turn improve blood flow to the nerves.
- In cases where the patient has severe limiting nerve pain they will need to be referred to a doctor to be assessed for neuroleptic medication such as gabapentin and amitriptyline.

Other complications to consider

- After a traumatic accident, additional complications can occur, such as complex regional pain syndrome (CRPS), which can cause increased pain, swelling and redness around a joint.
- Treatment will involve massage, gentle increased loading of the area, education and reassurance to help the patient to use the joint as normally as possible (Gifford 2002).
- Mal- or non-union, myositis ossificans and osteophyte or exostosis development in or around a joint are problems that are encountered during the treatment of trauma patients.
- It is important to consider these if a patient fails to respond to treatment as expected, in the appropriate timeframe.

Progression of treatment

- The rate and amount of progression during treatment varies with each individual patient.
- The more complicated the fracture or soft tissue injury, the longer it will take to heal; in addition, the type of fracture will be influential, e.g. transverse fractures heal faster than spiral fractures (Atkinson and Coutts 2005).
- Other medical conditions such as diabetes will extend the healing time and, in some cases, people take a long time to heal, irrespective of their age and health.
- In early management the physiotherapy will focus on maximising function and movement of the injured area/s within the boundaries of the trauma team instructions, e.g. treatment will aim to regain movement in an ankle following a fracture and internal fixation whilst they are non-weight bearing.
- When permitted to weight bear the patient should have the range of joint mobility to enable them to walk with minimal restriction from tight articular structures.
- Progression should encompass instructions from the trauma team or GP, which will be used in conjunction with clinical reasoning that takes into account the holistic knowledge obtained during assessment and subsequently, relating to the patient.
- This approach should ensure that appropriate progression of rehabilitation occurs, enabling patients to return to their normal lifestyle wherever possible.

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Chapter 17

E-materials

Author profile

Anna Vines BSC(Hons) MCSP

Anna has worked in trauma rehabilitation for 5 years and has been team leader in the Trauma Physiotherapy Outpatients department at the John Radcliffe Hospital in Oxford since 2008.

In addition to managing a clinical case load Anna's current role involves attending trauma clinics, maintaining an efficient liaison with the inpatient trauma team and linking with physiotherapy outpatient departments in Oxfordshire and the surrounding counties.

Warren Sheehan BPhty MCSP

Since graduating from the University of Queensland, Australia, in 2000, Warren spent two and a half years working at the Gold Coast Hospital where he completed a large range of rotations. The next two years led Warren to England where he mixed in some travelling and working until he reached Oxford where he has been working since 2004. In 2006 Warren became part of the trauma team at the John Radcliffe Hospital and is based in the Trauma Inpatients Unit.

Case Study 17.1

Patient

- Alan a forty-two-year-old male, who works as an electrician.
- Inverted his ankle whilst playing 5-a-side football and sustained a Weber B ankle fracture.

HPC

- Initially the injury was treated conservatively in a below knee cast to be non-weight bearing for 6 weeks until his fracture clinic appointment.
- In fracture clinic he had the ankle re-X-rayed, which showed an appropriate amount of callus formation and therefore the cast was removed.
- He was seen by the physiotherapist in the fracture clinic for his initial appointment.
- The referral from the trauma doctor stated that the patient was permitted to weight bear as tolerated in a walker boot and was allowed to be treated to achieve full range of movement.
- The boot was to be retained and gradually removed after 2–3 weeks.

Assessment

Social history

- As a self-employed electrician Alan was keen to get back to work as soon as possible, as he has had been receiving no income since the injury.
- He was also keen to return to playing 5-a-side football, which was central to his social life outside of work.

PMH and DH

- Alan had high blood pressure, managed with medication (Lisinopril).
- He had no other conditions, no contraindications or precautions that should be taken into account, e.g. cancer or osteoporosis.
- He had no history of previous injuries to the ankle or any other relevant fractures.

Objective assessment

Observation (OBS)

- Alan was seen initially non-weight bearing with two elbow crutches.
- He was not keen to rest the foot on the floor during the subjective examination.
- The foot was found to be swollen, slightly red and covered in dry skin.
- There was slight tenderness around the lateral malleolus and the whole foot was warm.

Active range of movement (AROM)

- Alan was reluctant to move his ankle and complained of pain on all active ankle movements.
- Dorsiflexion was limited to plantargrade, plantar flexion, inversion and eversion movements were minimal.

Analysis

- Alan was anxious about moving his ankle and about using it generally.
- At this point the assessment was finished as it was considered important to get Alan working on some mobility exercises, improving his gait and to show him how to manage the swelling and dry skin at home.

Treatment

- A walker boot was fitted and Alan was taught a heel–toe gait pattern with the two elbow crutches weight bearing as tolerated.
- Reassurance was given that the fracture was healing and that it was strong enough to walk in the boot.
- At this stage the exercises were non-weight bearing.
- AROM exercises were begun.
- Active assisted ROM exercises with a towel to assist the movements of dorsiflexion, inversion and eversion were taught.
- Sitting over edge of the bed, heel–toe exercises, ankle dorsiflexion stretches and toe

curling were also taught.

- Alan was taught how to use ice or contrast baths and elevation to control the swelling.
- Advice was given about the use of moisturiser and soaking, to help with the dry skin.
- Alan was warned that the ankle would swell and be painful as he began using it more. The need to take painkillers was emphasised.
- This advice may need to be followed for several months post injury.
- Alan was concerned about getting back to work and he was advised to seek help, making an appointment with the Citizens Advice Bureau, to help him manage his finances, whilst rehabilitating.

Management

- Alan has weaned from the boot over a 2-week period.
- He progressed to exercises in standing, with dorsiflexion stretches, calf stretches, single leg stand work and calf raises.
- The ankle ROM, muscle strength, knee to wall and single leg stand were monitored to ensure appropriate progression.
- Maitland's and Mulligan's mobilisations were introduced to improve dorsiflexion along with soft tissue mobilisation to the calf.
- Alan was referred into a lower limb class to introduce more demanding exercises and to provide the added confidence he needed prior to returning to work and eventually his sport.
- Alan was able to return to work at 13 weeks post fracture, gradually increasing the workload.
- He continued to attend as an outpatient to enable a return to football.
- It was decided that it was appropriate for him to return to football once he could stand on the leg using a balance board to ensure that his balance, strength and proprioception were sufficiently developed to cope with the demands of football.
- His running gait was rehabilitated which included cutting and jumping.
- He was advised to do some training prior to playing in order to regain his general fitness.

Case Study 17.2 Acute trauma preoperative management

Background

- Tom, 36 years, lives with wife in two-storey house.
- He works as an engineer.
- Plays football.

in.

- No regular medication.

Admission

- Admission to the trauma unit followed a road traffic accident in which he suffered a (R) midshaft femur fracture, a (L) tibial shaft fracture and a (R) chest injury consisting of rib 3 to 6 fractures and a pneumothorax.
- He was admitted via the accident and emergency department, where they inserted a chest drain.
- A CT of the body revealed no other injuries.
- From the notes prior to seeing the patient, the information gathered for the subjective examination was as follows.

Relevant past medical history (from medical notes)

- Previous (R) ankle fracture ORIF from which he recovered fully.
- Asthma, controlled by Ventolin.
- Smokes 5 cigarettes per day.
- Otherwise fit and well.

Assessment

- X-rays of lower limb fractures were described as:
  - Closed oblique fracture of the middle third of the (R) femur with 50% lateral displacement
  - Closed extra-articular multifragmented fracture of the distal third of the (L) tibia.

Preoperatively

Day 1 assessment

- Bedrest (L) leg in a backslab elevated on a Braun frame and (R) leg in skin traction.
- Chest drain had drained 500 mL.
- Auscultation revealed reduced breath sounds in the (R) middle and lower lobe.
- He was breathing 2 L oxygen via nasal prongs and his saturations were 98%.
- Coughing and deep breathes were painful ++.
- He was prescribed paracetamol and codeine.

- He reported no numbness or altered sensation and had full power of all joints that were able to be assessed.
- The (R) ankle and toes were the only joints to be tested as leg was in skin traction; (L) hip and knee were able to be tested, but ankle in backslab.
- All skin colour, pulses and capillary refill were normal on testing.
- He had full AROM of his upper limbs, (L) hip and knee and his (R) ankle.
- Using the overhead ring, he was able to lift his bottom and shift himself around the bed, but this was very painful.

Problem list

- Pain preventing patient from breathing properly and clearing secretions; shifting himself around the bed.
- At high risk of chest deterioration due to pain, rib fractures, pneumothorax, bed rest, possible fat emboli (especially due to femoral fracture) and past medical history of asthma and smoking.
- High risk of circulatory complications such as DVT.
- High risk of muscle weakness, tightness and reduced general fitness from bed rest and immobilisation of lower limbs.
- Risk of pressure areas from immobilisation, skin traction and backslab.

Treatment

- Pain management was the key treatment on day 1.
- The acute pain service started him on a PCA with a background dose.
- The patient was encouraged to use it as much as needed, particularly prior to physiotherapy.
- Chest physiotherapy consisted of deep breathing exercises, cardiovascular exercises, e.g. upper limb and general movement in the bed to encourage chest expansion and increased tidal volumes.
- A cough cushion was provided which the patient was encouraged to use for coughing, sneezing or moving in bed.
- AROM exercises for upper limbs were encouraged. Theraband was provided with a strength maintenance program.
- Pain initially prevented (R) shoulder ROM, so patient was taught AAROM exercises.
- (L) lower limb exercises consisting of AROM exercises for hip, knee and toes IRQ and (R) ankle AROM and stretches using a bandage were encouraged.
- Isometric gluteal and quadriceps contractions, (R) ankle df/pf and fl/ext (L) toes (FATS) were taught.
- The patient was encouraged to regularly relieve pressure by lifting his bottom.
- Exercises were advised to be done hourly and were written down as a reference for the patient.

Day 2

Assessment

- Chest drain was removed and chest X-ray showed a re-inflated (R) lung.
- Patient was using the PCA well and his pain was well controlled.
- There was an improvement in breath sounds in (R) middle lobe.
- Patient was managing all exercises well.

Treatment

- Chest treatment from day 1 and exercises reviewed.

Days 3–5

Assessment

- Pain controlled with PCA.
- Breathing had improved with breath sounds audible throughout all lung fields.
- He was breathing room air and saturations were 97%.
- He could perform a moderately strong dry non-productive cough.
- (R) calf muscles had become slightly tight due to the foot resting in plantarflexion.

Treatment

- Chest treatment.
- All exercises.
- Passive stretches of (R) ankle into DF, avoiding disturbance of skin traction or pain in (R) femur.
- A foot drop splint was applied at night to regain plantigrade at the ankle.
- From the patient's injuries it was foreseen that he would be bilaterally non weight bearing, so a wheelchair was ordered before his operations.
- Bilateral elevated foot rests were also ordered to elevate the (L) ankle and support the (R) knee.

At this point Tom was deemed ready for surgery as the oedema had subsided.

Case Study 17.3 Acute trauma postoperative management

Background

- Tom, 36 years, lives with wife in two-storey house.
- He works as an engineer.
- Plays football.
- House has one step at the front door, spare room with en suite downstairs that he can live in.
- He suffered a (R) midshaft femur fracture, a (L) tibial shaft fracture and a (R) chest injury consisting of rib 3 to 6 fractures and a pneumothorax as a result of an RTA.
- He was managed for 5 days preoperatively whilst swelling in the affected limbs subsided sufficiently for surgery to be undertaken.
- During the 5-day pre-operative period the occupational therapist had began the home set up, including bringing a bed downstairs as Tom was prohibited from climbing stairs for 6 weeks.
- A ramp was organised for the front door as he would be in a wheelchair when discharged home.

Operation

- Tom was operated on day 5 post injury.
- The following operations were carried out and their postoperative instructions were:
  - Antegrade intramedullary nailing of the (R) femur:
    a. Non weight bearing for 6 weeks
    b. No restrictions on movement
    c. No cast needed
  - ORIF of the distal (L) tibia using a bridging plate.
    a. Non weight bearing for 6 weeks
    b. Full movement of ankle allowed once wounds dry
    c. Exchange backslab for a lightweight, removable below knee cast.

Days 6 and 7 (Days 1 and 2 post operative)

Assessment

- Tom's respiratory function was assessed as he had undergone a general anaesthetic.
- He had decreased breath sounds bibasally.
- He was breathing room air with his saturation being 97%.
- His cough was dry and non-productive.
- All observations were normal.
- He remained on the PCA and pain was well controlled.

Treatment goals

- Monitor chest for deterioration due to preoperative trauma and now postanaesthetic.
- Improve ROM and strength of lower limbs (wound healing required before starting (L) ankle ROM).
- Arrange new cast for (L) ankle.
- Independent transfers and W/C mobility (bilaterally NWB for 6 weeks).
- Plan for discharge home.

Treatment

- Chest treatment.
- (R) AAROM exercises with sliding board. Tom able to achieve 35° hip and knee flexion and 15° hip abduction. He had full ankle ROM.
- (L) hip and knee AROM and strength maintenance exercises were continued.
- Ankle exercises were not yet permitted.
- A removable below knee cast was ordered from the plaster room.
- Tom began active knee ROM and strengthening exercises in sitting.
- Being young and healthy, Tom was able to sit over the edge of the bed for a substantial period of time and was keen to transfer to the wheelchair.
- He was taught how to slide transfer between bed and wheelchair via a transfer board, initially with 3 physiotherapy team members assisting to reduce the risk of falls.
- Tom was able to transfer with assistance of one person to assist with his legs.
- Safe wheelchair operation was taught and he quickly learnt how to mobilise around the ward.
- A CPM was applied to the (R) leg in bed.
- The occupational therapist oversaw the fitting of the ramp at Tom's home and a commode was ordered as his wheelchair would not fit into the toilet downstairs.

Day 8

- Wounds were all reviewed and reported as clean and dry.
- Doctors were happy for movement to begin in the (L) ankle and the plaster technicians applied the lightweight removable cast.

Assessment

- Chest clear, equal breath sounds throughout with 98% saturations on room air.
- (L) lower limb:
  - Hip and knee: full AROM with full power
  - Ankle: DF 0°; PF35°; INV 5°; EV 0°. Swelling around foot and ankle.
- (R) lower limb:
  - Hip: F 95°; Abd 25°; ER/IR normal; power 3+/5
  - Knee: F 95°; E 0°; power 4/5

  - Ankle: full AROM and power.
- Transfers
  - Independent sitting over side of bed
  - Independent at positioning transfer board
  - Independent at slide transfers between bed and W/C
  - Independent W/C mobility.

Treatment

- Tom was encouraged to continue breathing exercises, educated about signs and symptoms of chest deterioration and advised to report back to A&E if any of these occurred.
- AROM and strength exercises were shown for (R) hip, knee and ankle and (L) hip and knee.
- AROM and AAROM exercises were shown for the (L) ankle to encourage DF, INV and EV.
- All exercises were written down as a home exercise programme and advice was also given on how to maintain general fitness whilst in the wheelchair for 6 weeks.

Day 9

- Equipment was delivered to his house and he was discharged.
- An outpatient referral was completed and sent by fax to his local outpatient department for him to continue his rehabilitation.

Chapter 17 Trauma orthopaedic multiple choice questions

1. Which of the following would not be included with the initial referral?
   a). The patient's telephone number
   b). A full copy of the patient's medical notes
   c). The post op notes for this admission
   d). The physiotherapy protocol for the patient's injury
2. Which outcome measure would be most appropriate for a patient presenting for physio following conservative management of a burst fracture of L1?
   a). LEFS
   b). DASH
   c). ODI
   d). NDI
3. Which of the following may contribute to a delayed recovery?
   a). Compensation claim
   b). Overprotective family
   c). Anxiety and/or depression

d). All of the above

4. Which of the following does not require immediate medical attention following an outpatient assessment?
   a). Deep vein thrombosis
   b). Grossly infected wound
   c). Severe pain levels
   d). Recent alteration of bladder function
5. Which of these objective measures would be chosen to assess ankle dorsiflexion after an ankle fracture?
   a). Gait pattern
   b). Knee to wall
   c). Single leg stand
   d). Single leg heel raise
6. What intervention would be avoided while a patient is strictly touch weight bearing after an acetabular fracture?
   a). Muscle strengthening
   b). Gait re-education
   c). Active range of movement exercise
   d). Soft tissue mobilisation
7. What is least likely to cause permanent loss of range of movement after an intra-articular distal radius fracture, managed with a volar plate?
   a). The fracture type (intra-articular)
   b). The presence of the plate
   c). Joint hypomobility
   d). Pain
8. Which of the following does not tend to benefit from soft tissue mobilisation?
   a). Joint hypermobility
   b). Muscle shortening
   c). Joint swelling
   d). Muscle weakness
9. Which of these exercises would be best for retraining joint proprioception in the shoulder following a dislocation?
   a). Rotator cuff strengthening
   b). Press ups against a wall
   c). Scapula setting
   d). Range of movement exercises
10. Which of the following is not a symptom of complex regional pain syndrome?
   a). Redness
   b). Hair growth
   c). Brittle nails
   d). Potent odour
11. Which of the following fractures would most likely have a postoperative instruction of

touch weight bearing?

a). Ankle fracture
b). Total hip replacement
c). Acetabular fracture
d). Tibial plateau fracture

12. Which symptom is not a sign of compartment syndrome?

a). Pain
b). Increased temperature
c). Paraesthesia
d). Decreased pulses

13. Which of the following is NOT a principle of fixation?

a). Ensure fracture is anatomically reduced
b). Preserve soft tissue when fixing fracture
c). Immobilise affected joint to allow fracture to heal
d). Stabilise fracture to allow healing

14. Which one of the following imaging techniques would be most useful in assessing a meniscal tear?

a). X-ray
b). Ultrasound
c). CT
d). MRI

15. Which of the following type of injuries is least likely to contribute to a neurological injury?

a). Undisplaced tibial plateau fracture
b). Midshaft humeral fracture
c). Acetabular fracture
d). Head injury

16. Which of the following methods of fixation would lead to absolute stability of the fracture?

a). External fixator
b). Locking plate and locking screws
c). Kirschner wires
d). Compression plate and screws

17. Which of the following would not delay healing of a fracture?

a). Smoking
b). Diabetes
c). Infection
d). Obesity

18. Which of the following treatment options should be avoided with a patient who has sustained an acetabulum injury?

a). Inner range quadriceps exercise
b). Gait re-education

c). Straight leg raise
d). Active range of motion of the hip joint

19. Which of the following fixations limit early range of motion?
    a). Kirschner wires of the distal radius fracture
    b). Tension band wiring of the patella fracture
    c). External fixation of a tibial shaft fracture
    d). Compression plating of a radial shaft fracture
20. Which of the following best describe a 2-part fracture, not in continuity?
    a). Multifragmented
    b). Angulated
    c). Displaced
    d). Spiral

Trauma orthopaedic multiple choice answers

1. b)
2. c)
3. d)
4. c)
5. b)
6. a)
7. b)
8. a)
9. b)
10. d)
11. c)
12. b)
13. c)
14. d)
15. a)
16. b)
17. d)
18. c)
19. a)
20. c)

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